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ARCHIVES OF OTOLARYNGOLOGY

VOLUME 8 DECEMBER, 1928 NUMBER 6

OTOLOGIC AND OTHER MANIFESTATIONS OF A DIET DEFICIENT IN VITAMINS

ANIMAL EXPERIMENTATION *

ROY A. BARLOW, M.D.
Section on Rhinology and Otolaryngology, Jackson Clinic
MADISON, WIS.

This is an age of analysis and reasoning, not alone the analysis of thought, modes of thought and conduct of living, but the analysis of material things: foodstuffs and drugs. Not only has this analytic trend interested those persons directly associated with the professions and sciences, but the laity has become imbued with the never ending question, "Why?" In past generations, it was customary for the physician to prescribe medicine empirically to obtain results. He combined numerous drugs for their numerous effects. He made keen observations and was thus enabled to state firmly that certain drugs produced certain results.

This method of reasoning does not suffice today. Fortunes have been spent in analyzing the properties and actions of drugs and chemicals, and today, through this scientific analysis, one can definitely answer why certain results are obtained. The same change has taken place in the general attitude toward foodstuffs. In previous generations, when competition was less keen and the population less congested, the housewife prepared a diversified diet aimed to please and to reflect credit on her culinary artistry. The methods of preserving were crude. It was necessary to preserve cabbage in the form of kraut; root vegetables were stored in sand, and meat was salted down. But these methods answered the need of the time. Now, however, with the populace living in congested centers, with food being hauled from great distances, and with modern methods of scientific preserving and preparing, the question is asked why certain foods seem to produce certain results. The modern mode of living necessitates an accurate knowledge of the essentials of diet. The fact is being recognized that the body reaction to discrepancies in food is becoming manifest in definite pathologic conditions and clinical observations. Surgery has its place and always will have, but the trend of the times is toward preventive measures.

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* Read at the meeting of the American Laryngological, Rhinological and Otological Society, Washington, D. C., May 3 to 5, 1928.

A few years ago it was the calories principally which concerned the computers of diet; today it is the vitamins. The publicity given the subject of vitamins has been universal and, as usual, broad, encompassing statements were made concerning the amount of action of vitamins in the diet. The subject is intensely fascinating, and as progress is made in its more scientific aspects, new thoughts and new conceptions are confronted on every side.

In connection with this interest in vitamins, it had been suggested that there might be a possible connection between deficiency of vitamin D and the production of deafness because of the changes in bone in rickets, and in a previous report [1] it was definitely established that deficiency of vitamin D in itself was not a factor in the production of loss of hearing.

The present report is based on the work that has been carried on relative to the possibility of the other vitamins and their relation to

Figure 1

Figure 2

Fig. 1.—Rat with conjunctivitis following diet deficient in vitamin A.

Fig. 2.—Rat with enlarged ocular globe which developed during healing process after being on a diet deficient in vitamin A.

disturbances of the ear, nose and throat, especially the disturbances of hearing.

The investigation was conducted as with vitamin D. Sections were made of the bony capsule of rats that had been on a diet deficient in vitamin A. This vitamin A, or fat-soluble A, as it is commonly known, is found most abundant in such foods as butter fats. Its absence in the diet is marked by changes in the mucosa of the respiratory tract, by edema and small cell infiltration, even to desquamation, pro-

1. Barlow, R. A.: Does Vitamin-Deficient Diet Cause Deafness? Results of Animal Experimentation, Laryngoscope **37**:640, 1927.

ducing lowered resistance for infection of the respiratory tract. So marked is this tendency that great difficulty is experienced in preventing the development of fatal pneumonia in these animals that have been deprived of vitamin A. A rhinitis develops early with nasal discharge, sneezing and wheezing. In addition, marked conjunctivitis appears, and as the deficient diet is continued, xerophthalmia, a characteristic change in the cornea, takes place, with corneal ulceration. All of this can be produced on a so-called "A deficient" diet:

Casein (extracted with alcohol and heated)	18 per cent
Agar-agar (for roughage)	2 per cent
Salts 40	4 per cent
Yeast	8 per cent
Dextrin (cooked starch)	68 per cent
Total	100 per cent

Fig. 3.—Roentgenogram of rat that had been on diet deficient in vitamin A; changes in the bone are not noted.

At this stage, the vitamin is reestablished in the diet with marked beneficial results. The nasal secretion becomes less marked and the respiratory difficulty is less noticeable. The condition of the eye also improves—the conjunctivitis clears up and the ulcers of the cornea heal, with opacities—but in the curative process the eyeball or globe may become markedly enlarged. It may become so prominent that the lids cannot be closed. It may be bilateral or unilateral. At first this was considered true exophthalmos, but in reality it is an enlargement of the globe, a condition designated by ophthalmologists as buphthalmia or ox-eye.

Sections of the eye disclose the fact that this is apparently a keratotic change, with a weakening of the scleral wall, which gives way or becomes distended due to the intra-ocular pressure. This is extremely interesting, since, so far as is known, the change or distortion is permanent.

Pathologic changes are not found in the ears due to deficiency of vitamin A. Sections of the bony capsule, stained with nitrate of silver as described in a previous article, do not demonstrate bony changes. Roentgenograms of rats fed on a diet deficient in vitamin A do not show skeletal changes in the bony labyrinth.

When a diet deficient in vitamin A is given, the epithelium of the respiratory tract seems to be affected before any other tissue, except that of the eye. I feel that this diet predisposes to sinusitis and the usual respiratory diseases. Daniels advocates the administration of fat-soluble A in butter fat for children prone to develop infections of the respiratory tract. This suggestion has been followed by other clinical observers, and in some cases definite improvement has been noted. It must be borne in mind that other factors play a part in the general economy of the respiratory mechanism of man, and that the giving of a food rich in vitamin A is not a panacea for all disturbances in the respiratory tract, but there is no doubt that it is one of the factors and, as such, deserves all the emphasis that has been placed on it.

One might continue along this line of thought and advise the addition of a diet rich in vitamin A in the feeding of patients in the hospital, regardless of their age or pathologic condition, who are bedridden or confined indoors for a long period of time. One is justified in thus assuming that the addition of vitamin A might prevent the development of hypostatic pneumonia or at least the respiratory cough so frequently observed in patients confined in bed for a long time.

Vitamin B, or antineuritic vitamin, has been the subject of much discussion. Many of the early workers designated a specific change in the nervous system due to the deprivation of vitamin B; the more recent and exhaustive work of Drummond and Kon [2] has conclusively demonstrated that this vitamin B is not a distinct nerve vitamin but is more intimately associated with general nutritional changes.

Drummond and Kon used pigeons, instead of rats, and in all cases an equal number of control birds were observed. The pigeons were placed on the following diet:

Rice starch	66 per cent
Caseinogen	16 per cent
Agar-agar	8 per cent
Butter	4 per cent
Filter paper powder	2 per cent
Salts	4 per cent
Total	100 per cent

2. Drummond, J. C., and Kon, S. K.: Physiological Rôle of Vitamin B; Study of Vitamin B Deficiency in Pigeons, Biochem. J. **21**:632, 1927.

These birds soon began to develop characteristic symptoms of vitamin B deficiency as shown by former experiments. There was loss of weight, a tendency to remain quiet the first few days, followed by lack of appetite for the diet deficient in vitamin B. They picked about aimlessly, apparently searching for more delectable food. They then developed symptoms of nervousness. They started at any noise or stimulation. In many there was spontaneous development of convulsions, "cart-wheel" tumbling and opisthotonos. After each convulsive attack, they became more quiet but soon exhibited a remission of the symptoms.

The birds were killed and examined carefully. One bird in particular had shown typical retraction of the head for days. This position had been readily overcome and the head returned to a normal position; however, on the slightest disturbance the head would again become retracted. The experimenters attribute this to alteration in the muscle tone. The nerve endings were normal; a change could not be demonstrated. A demonstrable paralysis was not present, and the position of the head bore most resemblance to forced movements as from the labyrinth, midbrain and cortex.

The birds had been fed vitamin B, and within a few hours the symptoms of nervousness had improved. This recovery could not have taken place so quickly if there had been any demonstrable change or pathologic condition in the nerve tissue. The convulsion and tumbling would not have vanished so completely. Some additional factor, therefore, must exist which has as yet remained unanalyzed.

The control animals, those having vitamin B but a diet restricted in nutritional elements, had developed similar lack of appetite and even nervousness and occasional convulsions, and they too had recovered when placed on normal diet.

The conclusions based on these experiments preclude the specific antineuritic property of vitamin B. The symptoms are those of starvation. There can be no relationship between degeneration in the nerve tissue and symptoms like those described.

Vitamin C, found most abundant in vegetables and fruit juice, has to do with the condition known as scurvy, associated with subperiosteal hemorrhage. It is practically impossible to demonstrate scurvy in the laboratory, as the usual laboratory animal is able to manufacture vitamin C synthetically within the liver. Man and the monkey are the only animals in which scurvy develops as a result of deficiency of vitamin C. As scurvy is a cutaneous, mucous membrane and periosteal disturbance, changes in the bony capsule of the ear would not be expected.

The remaining vitamins, E, F and G have specific actions, and this fact leaves no possibility of their effect on the ear.

I have been unable to demonstrate in this and previous studies that deafness is caused by a diet deficient in vitamins. Changes in the bone are not noted by the silver salt method in animals fed on a diet deficient in vitamin D, and nerve changes are not demonstrable in the presence of a diet deficient in vitamin B. There remains the vague possibility that a diet deficient in vitamin A, which produces such marked changes in the mucous membrane of the respiratory tract, might cause enough edema in the eustachian tube and middle ear to be responsible for impairment of hearing during later life. This is purely hypothetic.

It must be borne in mind that the knowledge of vitamins is still meager and that every day new facts are being learned which alter

Fig. 4.—Section of nasal mucosa showing keratinization and edema, predisposing factors in respiratory infections; × 25.

or modify some of the properties already elicited. It has been demonstrated that other factors are essential for the most pronounced action of vitamins. Vitamin D is dependent on a proper amount of calcium and phosphorus for its complete action in rickets. It has also been shown that the amount of vitamin necessary to secure proper results with phosphorus and calcium is much less than was at first stated. The recent work of Hart, Steenbock and Waddell [3] in demonstrating the necessity for copper sulphate in the successful treatment with liver of patients with anemia has opened an entirely new field of endeavor. This work is probably one of the most monumental achievements in

3. Hart, E. B.; Steenbock, Harry, and Waddell, J.: Unpublished data.

years in the field of medical science. It emphasizes the need of metallic salts in the economy of life. It also shows the need for more interest and accurate knowledge in the source of food supply and the character of the soil in which the food is grown.

Hart, Steenbock and Waddell noted that when rats were fed on a diet of whole milk, severe anemia developed and they endeavored to find the cause of this baffling situation. They added iron to the diet in the form of ferric chloride with only slightly beneficial results and often with none at all. Lettuce in the diet gave variable results; some lettuce seemed to be nutritious and some of no value. Lettuce

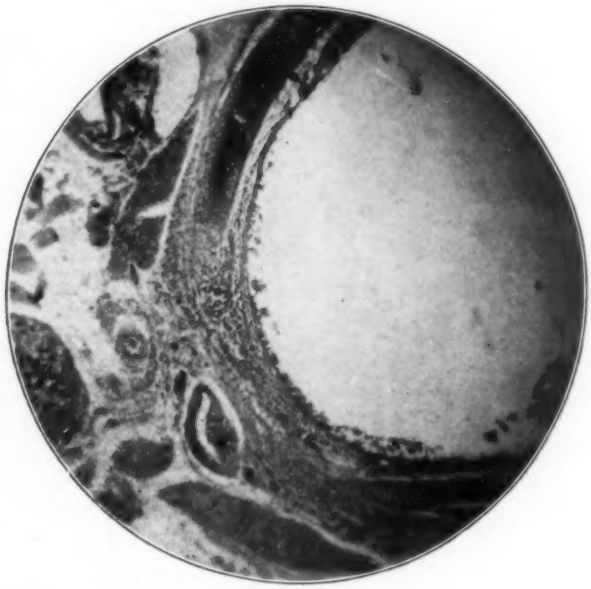

Fig. 5.—Section of trachea showing keratinization due to lack of vitamin A in the diet; it predisposes to respiratory changes; × 25.

from the various lots was burned; in some instances the ashes were green, and on analysis were found to contain copper sulphate. The investigation was continued, and it was found that lettuce shipped in from the South was rich in copper, while the native lettuce contained little, if any. On the basis of these observations, copper sulphate was added to the whole-milk diet, and startling results were obtained. The condition of the rats improved: the roughened coat became sleek and smooth; the pigment in the eyes deepened, and the hemoglobin increased from 40 to 80 per cent. Further study demonstrated that when ferric chloride was also added, the blood picture returned almost to normal. Since this startling discovery, an exhaustive study of various metals

has shown that the condition of animals with anemia responds most satisfactorily when their diet includes liver containing vitamin B, copper sulphate and ferric chloride. Zinc was also tried, but there was little improvement and no result at all with manganese. A report of this work was made at a meeting in Ann Arbor, in April, 1927, and was enthusiastically received. The information is now applied clinically in the treatment of pernicious anemia.

A new world of research has thus been opened, and no one may say just where it will lead. It emphasizes the statement I made a year ago that with the increasing knowledge of some of the fundamental

Fig. 6.—Section of lung from rat on diet deficient in vitamin A; the pneumonia resulted from secondary infection; × 25.

sciences and a more profound understanding of the source of food supply and factors pertaining to it, a more comprehensive attitude toward the human mechanism and toward disease will result.

CONCLUSIONS

1. Vitamins A and B are not factors in bony changes in the internal ear, and a diet deficient in these vitamins is not a predisposing cause of deafness.

2. Deficiency of vitamin A causing changes in the mucous membrane of the respiratory tract might be considered as a possible factor in the production of changes in the soft tissue of the middle ear, which might become permanent.

3. Further study of vitamin, mineral and metal salt contents of the bone may elicit additional facts which may be of inestimable value as regards knowledge of the content of the bone.

4. It is important that specialists in diseases of the ear, nose and throat should interest themselves in the comprehensive advances in scientific investigation now being carried on in various laboratories, along the lines of chemistry and physiology.

ROENTGENOLOGIC SIGNS WHICH INDICATE EXTENSION OF INFECTION FROM THE ETHMOID AND SPHENOID SINUSES TO THE BASE OF THE SKULL*

G. E. PFAHLER, M.D.
PHILADELPHIA

The involvement of the base of the skull from an extension of infection from the ethmoid and sphenoid sinuses was first observed by Hirtz [1] in his work during the year 1924. He was at once impressed with the fact that it was probably more important than the involvement of the mucous membrane of the sinuses.

For these studies, a good roentgenogram must be made of the base of the skull. This is best made by placing the top of the head downward on a Potter-Bucky diaphragm so as to bring the base of the skull as nearly parallel to the film as is possible. The central ray is directed through the larynx toward the vertex of the skull.

The normal skull and sinuses will show anteriorly the alveolar process, the teeth and the mandible forming the anterior and lateral borders of the ethmoid, maxillary and sphenoid sinuses. The frontal sinuses are rarely shown, and when shown are nearly obliterated by overexposure. From front to rear one recognizes the ethmoid cells divided by the nasal septum, then the sphenoid sinuses, the basilar plate, the anterior arch of the atlas, the odontoid process of the axis, the foramen magnum and the occiput. On each side from front to rear, in the same order, one recognizes the middle and posterior fossa of the skull separated by the petrous portion of the temporal bone and the mastoid processes.

Normally, the lines and the cancellous structures are sharply defined; the bone is evenly and symmetrically dense. The air-containing cavities show a symmetrical transparency and a general appearance of health. The roentgenologic signs of superficial sinusitis are a cloudiness of the affected cavity. The walls show a decreased thickening, and at the same time an indistinctness or haziness in the acute stage. This indistinctness in and about the wall or at the borders is variable in extent, but in the frontal region it can be recognized at times for more

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* Submitted for publication, July 23, 1928.

* Read before the Section on Laryngology, Otology and Rhinology at the Seventy-Ninth Annual Session of the American Medical Association, Minneapolis, June 14, 1928.

1. Hirtz, E. J.: Les signes radiologiques de l'extension des infections sinusiennes profondes a la base du crâne et au mésencephale, J. de radiol. et d'électrol. **11**:305 (June) 1927.

than 1 cm. beyond the sinuses. At a later stage, this border on the outside of the sinus becomes denser than the surrounding bone, owing to an increase in lime deposit—the defense reaction in bone—and indicates an osteitis or perisinusitis.

ROENTGENOLOGIC SIGNS OF DEEP PERISINUSITIS

The changes incident to chronic ethmoid-sphenoid sinusitis consist of a cloudiness with a vague shading off of the anatomic details, accompanied frequently by a thickening of the posterior and lateral wall of the sphenoid and ethmoid sinuses, and associated with an area of increased density, which indicates an osteitis in the surrounding bone. This areola of dense bone corresponds in every detail to the perisinusitis in the frontal region previously described. This condition is not shown, except in association with sinusitis affecting the ethmoid or sphenoid sinuses. Therefore, Hirtz and Worms have named this condition "perisinusite profounde." [2]

This perisinusitis commonly extends into the middle fossa of the skull, but it may extend into the petrous and mastoid portions of the temporal bones, and even into the posterior fossa. At times, this deep perisinusitis is general and involves the base of the skull. At other times, it is confined to one side, but it always corresponds to the side in which there is a deep sinusitis. Therefore, it must be concluded that it is an extension of the inflammation directly from the affected sinus. This extension of the inflammation from sinusitis may also be recognized in the anterior fossa by means of the oblique frontal-plate position (Waters position). This demonstration of the extension of the inflammation to the bones forming the base of the skull would lead one to assume that the duramater which takes the place of the periosteum on the inside of the skull becomes also affected, as is indicated by the case reported subsequently in which the patient died from a meningitis.

As a result of an extension of this inflammatory process, one can assume indirectly an effect on the sella turcica, which may account for the anomalies which have been observed for many years, but which radiologists have been unable to explain. These changes about the sella consist of a calcification of the bridge or ligaments connecting the anterior and posterior clinoid processes, the formation of osteophytes about the posterior clinoid processes, hypertrophied tips of the clinoid processes, calcification of bands extending from the posterior clinoid processes backward or flocculent lime deposits posterior to the clinoid processes.

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2. Hirtz, E. J., and Worms: Des perisinusitis profonde, Ann. d. mal. de l'oreille, du larynx **45**:833, 1926.

The alterations noted so often may be divided into two classes: (1) those which affect the sella turcica and (2) those which affect the adjacent structures.

In the first class the clinoid processes are affected. The anterior processes are less frequently changed, and at times they are only elongated without being thickened, while the posterior clinoid processes usually show periostoses or hyperatoses. Bridging processes may at times be observed between these processes. The posterior clinoid process may be distinctly clubbed.

The anomalies in the retrosellar region are: (1) bands of variable length, having the aspects of rather dense, evidently calcified ligaments which represent the posterior pretroclinoid ligaments and which probably indicate that there has been a local chronic meningitis, and (2) flocculent lime deposits lying posterior to the sella which probably indicate deposits in the walls of the vessels.

Hirtz studied a series of 144 with reference to the calcification of the pineal gland, and found calcification in seventy-seven cases, or 56 per cent, but in none did he find this calcification unless there was associated evidence of deep perisinusitis. He stated that calcification is not due to old age.

Schüller [3] expressed the belief that the calcification of the bands extending from the clinoid processes are merely modifications of the normal, and that they are not of any clinical importance, but he admitted that inflammatory processes may extend from the sphenoid sinus to the sella. With definite evidence of osteitis in the surrounding portions of the base of the skull, the assumption of a similar extension to the sella would seem justifiable.

REPORT OF A CASE OF MENINGITIS FOLLOWING OPERATION ON THE ETHMOID AND SPHENOID SINUSES [4]

History.—A woman, aged 42, presented herself in November, 1927, complaining of dizziness, headache and postnasal dropping which was most marked on arising in the morning; she also complained of a foul odor at times in the back part of the nose. This trouble had begun about a year or so previously to presentation, but had become worse during the past three months. When her symptoms had first appeared, she also had had an infected right maxillary sinus, which was apparently cured by irrigation.

Examination.—Rhinoscopic examination did not disclose any abnormalities in the anterior nares. The mucous membrane was then cocainized and the nasal cavity cleansed with normal physiologic sodium chloride solution. Through a nasopharyngoscope a stream of thick yellow pus could be observed coming from the right posterior ethmoid cells and dropping into the pharynx. The left side of the nose was normal. The antrums were irrigated and were found to be normal.

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3. Schüller: The Sella Turcica, Am. J. Roentgenol. **16**:336 (Oct.) 1926.

4. Presented before the staff of the Graduate Hospital of Philadelphia by Dr. W. Whalen, March 12, 1928. Reported here by permission of Dr. Whalen.

X-Ray Observations.—The frontal sinuses were large and clear. The sphenoid sinuses were clear. The ethmoid cells were extensively diseased, especially on the right side, and the right maxillary sinus was opaque.

There was shown, especially in the base of the skull, an osteitis surrounding a small cell region, to the right of the sphenoid, and a larger one to the left of the sphenoid in the middle fossa of the skull. The latter was probably an osteitis

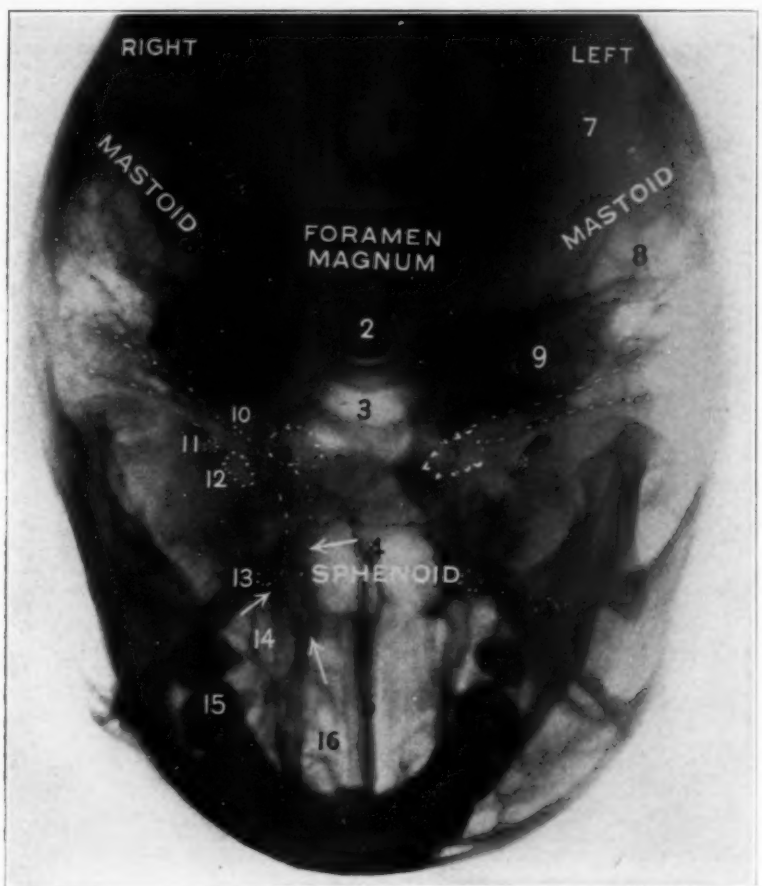

Fig. 1 (Mrs. H. A. J., referred by Dr. W. Zentmayer, March 27, 1928).—Normal film of the base of the skull. The anatomic details in the median line from above downward should be noted: 1, foramen magnum, with a ring of the adontoid process; 2, the axis; 3, transparent area caused by the pharynx; 4, transparent area of the sphenoid sinuses; 5, the nasal septum in the median line on each side, and 6, the septums of the ethmoid cells. Lateral to this from above downward are: 7, the occipital bone; 8, the mastoid process; 9, the petrous portion of the temporal bone; 10, the groove of the internal carotid artery, leading into the cavernous groove; 11, the foramen spinosum; 12, foramen ovale; 13, the foramen rotundum; 14, the maxillary sinus, and 15, the teeth. All of the bony tissue is uniform in density and normal in structure.

extending backward from a former disease of the ethmoid. In the accompanying figures, I have indicated with small arrows this area of increased density which indicates an increased lime deposit resulting from an old chronic inflammation. This, of course, does not show that the process was active.

The patient was treated conservatively for a while, without any benefit. In fact, on one occasion when she presented herself for treatment, she said she was so dizzy that she found it difficult to walk straight. The ears were normal. The teeth were in good condition. The tonsils had been removed carefully several years before

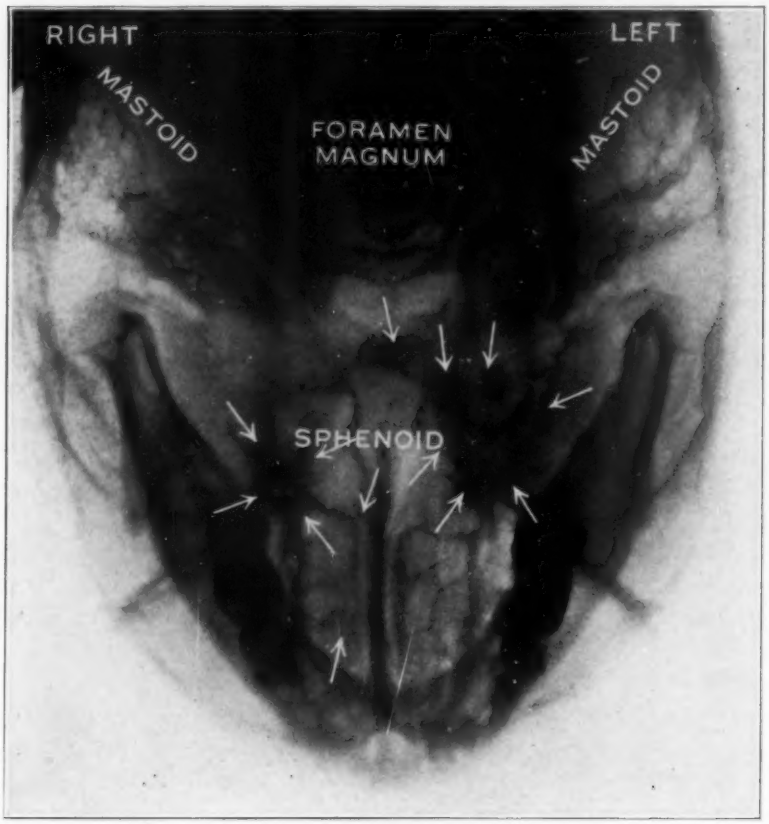

Fig. 2 (Mrs. H. E. B., referred by Dr. Whelan, Jan. 5, 1928).—In addition to the details described in figure 1, the area of increased density in the left middle fossa should be noted and to a lesser extent, the anterior portion of the right middle fossa. These lesions in the left middle fossa are probably the result of the chronic inflammatory process. Note the absence of the lines of the septums in the right ethmoid region. This indicates an acute process. Operation showed pus in the region of the right ethmoid sinus.

presentation. A Bárány test was not made because there did not seem to be any indication for it.

On Jan. 24, 1928, with cocaine and epinephrine anesthesia, the right middle turbinate was removed. The anterior and posterior ethmoid cells were exenterated,

and marked evidence of disease such as polypi and pus was found in the posterior cells. The ostium of the sphenoid was enlarged downward and externalward. Pus was not found in the sphenoid cavity, and the mucous membrane lining this sinus appeared to be normal.

The patient returned to her room, and the next morning at 5 o'clock there was a sudden rise in temperature to 103 F. by rectum. This was accompanied by a number of alarming symptoms. The headache became more intense, particularly in the occipital region, and the eyes became sensitive to light. Nausea and vomiting

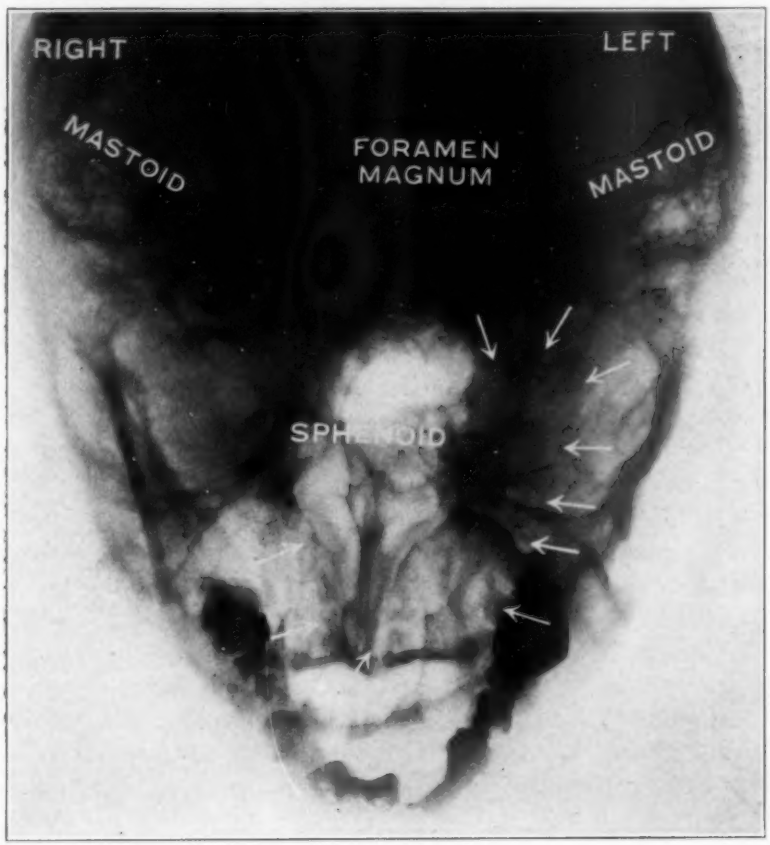

Fig. 3 (Mrs. D. S., referred by Dr. J. W. Armstrong, Jan. 28, 1928).—Roentgenogram showing evidence of disease of the ethmoid sinus on the left side, with an osteitis extending backward into the left middle fossa.

developed, whether or not food was taken. This symptom became so severe that rectal feeding had to be resorted to. The temperature ranged between 100 and 104 F., and on the third day following operation was accompanied by a definite chill. These symptoms persisted in varying degree for nine days, when the patient suddenly expired. She had been conscious and her mind had been perfectly clear throughout the postoperative illness.

The following laboratory observations and clinical examinations were made during the patient's stay in the hospital. Results of urinalysis were negative. The leukocyte count on the day following the operation was 23,200, with 91 per cent polymorphonuclears. The next two counts showed that the number of leukocytes had decreased to 14,000 and 11,000, with 78 and 86 per cent polymorphonuclears. There were two counts of 18,000, each made two days before death, with a drop in the polymorphonuclears to 68 per cent, probably indicating the increasing severity of the infection as well as the waning of the patient's resistance. On the second day of illness, the blood culture was made and found to be negative. On the last day of illness, the second blood culture showed a hemolytic streptococcus.

Spinal puncture was made eight days after the operation. The appearance of the fluid was cloudy; there were 4,480 cells per hundred cubic centimeters and 98 per cent polymorphonuclears. Sugar was not present. The test for protein was strongly positive. Streptococci were found on culture.

The results of examination of the eye were practically negative, with the exception of a slight fulness of the left retinal veins. These observations were recorded the day before the patient died.

The neurologic observations were practically negative until the last twenty-four hours of illness, when the patient began to show some weakness of the sixth nerve on the left side and definite rigidity of the neck.

SUMMARY AND CONCLUSIONS

1. Sinusitis affecting the ethmoid and sphenoid sinuses can be demonstrated by a thorough roentgenographic study.

2. The extension of chronic deep sinusitis to the base of the skull can frequently be demonstrated.

3. This evidence consists of a local or general osteitis. It may affect the anterior, middle or posterior fossa, and may be unilateral or bilateral.

4. The disease in the base of the skull is indicated by increased density due to increased lime deposit. This lime deposit is probably due to a reaction of the dura mater, which has become inflamed.

5. Certain deformities or anomalies of the sella turcica and its attachments may be due to an extension of this inflammatory process. These changes consist of deformities, hypertrophies and the formation of osteophytes, flocculent lime deposits and calcification of ligaments. These symptoms would indicate the possibility of an extension of this inflammatory process to produce a more or less chronic meningitis.

6. This condition is best shown by a roentgenogram of the base of the skull.

ABSTRACT OF DISCUSSION

Dr. Ross H. Skillern, Philadelphia: When I first saw this demonstration a few weeks ago, I was filled with amazement and consternation: amazement that a condition of this sort could have gone on so long in many of the patients on whom I had operated during the last twenty years, and consternation to think of some of the narrow escapes I must have had with some of these patients as far as the presence of meningitis was concerned. As a matter of fact, I can count the deaths

resulting from meningitis in these cases on the fingers of one hand, and I am reasonably sure of the cause of those deaths. How can we reconcile these roentgenographic observations of Dr. Pfahler with the actual clinical results that we have had? I think that the matter lies largely in the interpretation of the films. I understand that Dr. Pfahler considers that these changes were due to pathologic infection. Many years ago I had occasion to do some original research work on the ethmoid sinuses—some of the older men will remember it—on the so-called cysts of the middle turbinate. During the microscopic examination, the condition in many of these cases was found not to be pathologic but only the normal process from reabsorption of bone, and these so-called cysts were nothing but ethmoid cells. In all of these cases, we saw a great deal of reabsorption as well as formation of bone without any evidence that a pathologic condition had preceded. Why could not the same thing occur as in this case? But we must remember that reabsorption as well as formation of new bone is a perfectly normal process. Such roentgenographic observations would certainly not deter me from operating should the other indications for operation be present, nor would I expect any untoward effects. While Dr. Pfahler's presentation is of great interest academically, nevertheless, to me it is a great comfort to believe that it is not of so much import so far as contemplated intranasal operation on the ethmoid sinuses is concerned.

Dr. Robert G. Reaves, Knoxville, Tenn.: Dr. Pfahler has shown what I had nerve enough to assume in my paper, but did not read because I did not have time. I stated that the reason I failed to get good results in some cases was that the bony changes had extended into the surrounding bones of the skull, and in those cases even though I had done all I could in the sinuses, I still left some pathologic areas somewhere about the bone that were beyond my reach. I think Dr. Pfahler's pictures showed that plainly.

Dr. Samuel Iglauer, Cincinnati: I am a little puzzled about the anatomy. In the films which Dr. Pfahler showed, there was an extension into the middle fossa. On anatomic grounds, one would expect such an extension into the anterior fossa. I suppose it is technically difficult to show the anterior fossa, but possibly if Dr. Pfahler could devise a method he would also show these bony changes more frequently in the anterior than in the middle fossa. If the sphenoid sinus were involved, I could understand the extension backward, but it is difficult to understand involvement of the middle fossa by extension from the anterior ethmoid sinuses or the antrums.

I think Dr. Pfahler has helped us out in one phase. As is known, it is customary for the internist to send his patient to the roentgenologist for rhinologic diagnosis, and then to send the patient with the film to us. The internist and the roentgenologist together have made a diagnosis of sinus disease, and often we do not find evidence of it. The film that the patient brings with him is explained by what Dr. Pfahler has shown us, namely, that the patient at some time had sinus infection which left its footprints in the walls of the sinus. There is no active disease at the time we see the patient. There is nothing for us to do.

Dr. George E. Pfahler, Philadelphia: I think that Dr. Skillern probably misunderstood me. I stated at the outset that these observations do not indicate operation. The indications for operation, I think, must at all times be judged by the clinical evidence. The object of this demonstration was to help furnish diagnostic evidence which must be correlated with the clinical evidence and is in no sense a diagnosis in itself. I think that the osteitis that is present, however, is an actual pathologic condition. As Dr. Iglauer has said, it may be footprints reminiscent of former disease, but if the patient has symptoms that refer to some

of the structures about the base of the skull and we do not find this condition, it may furnish a clue for the rhinologist to find treatment and give the patient relief—and that is the object of this study. This osteitis may involve any part of the base of the skull—frontal sinus, ethmoid plate, clinoid process, or it may extend back as far as the base of the skull. It does not follow that the patient has or will have a meningitis. It is a condition in the bone, just as in chronic osteomyelitis when a man may have a marked increased density of the long bones and yet be able to walk as far and do as much work as anyone.

HOW AND WHEN THE MUCOUS MEMBRANE OF THE MAXILLARY SINUS REGENERATES

AN EXPERIMENTAL STUDY IN THE DOG *

CHARLES D. KNOWLTON, M.D.
BOSTON

WITH THE ASSISTANCE OF

G. W. McGREGOR, M.B.
TORONTO

A question long present in my mind was: What histologic changes occur after removal of the lining of the maxillary sinus? I sought information from various friends and acquaintances who are doing work on the sinuses. The reply from all was uniform and positive, namely, that a new lining composed of "low-grade, easily re-infected fibrous tissue" appeared following the radical operation on the antrum.

In discussing this question with Dr. Harris P. Mosher, about eight months ago, I said it would be a satisfaction to me, and, I thought, of interest to others, actually to see and to know what happened in the antrum following operation.

Dr. Mosher promptly suggested that such research be attempted and that dogs be used for the purpose. In subsequent experimental work, which was carried on in Dr. Mosher's laboratory at the Harvard Medical School, I was fortunate to have the assistance of Dr. Gregor W. McGregor, who took charge of all histologic detail.

I selected three large dogs weighing about 60 pounds (27.2 Kg.) each. After these dogs were operated on, the plan was to observe the antrum changes at the end of one month, three months and six months.

In one dog, the right antrum was operated on, Dec. 20, 1927, and the left antrum, on Jan. 5, 1928. Autopsy was performed three months after operation.

In another dog, the right antrum was operated on Jan. 13, 1928, and the left antrum, on Feb. 3, 1928. At the end of five months, autopsy was performed. The original plan was to perform the autopsy six months after operation, but the dog contracted pneumonia at the end of five months and died after three days' illness. Fortunately this did not interfere with the observations on the antrum.

In the third dog, the right antrum was operated on May 4, 1928. Operation was not performed on the left antrum. Autopsy was performed on this dog in one month.

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* Dr. Peterson of Chentu University, West China, and Dr. Hara of Los Angeles assisted in the operative part of the work.

ANATOMIC CONSIDERATIONS

The applied anatomy of the dog's nasal accessory sinuses presents some features that are not exactly like those of man. The lining of the sinuses, however, is identical with that of man, except in the maxillary

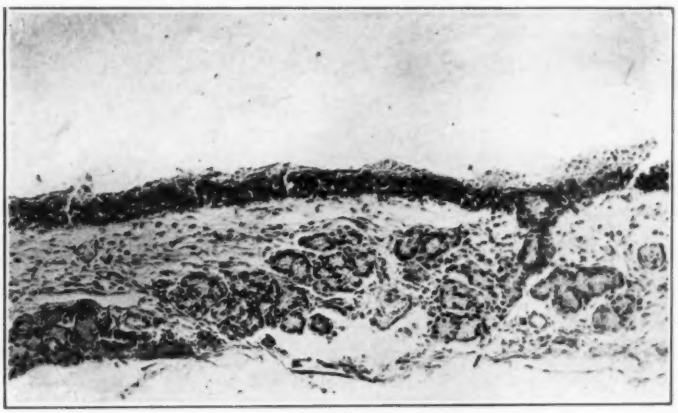

Fig. 1.—Normal adult dog. The lining membrane of the maxillary sinus, showing ciliated columnar epithelium with few goblet cells, and many gland structures in the subepithelial tissue.

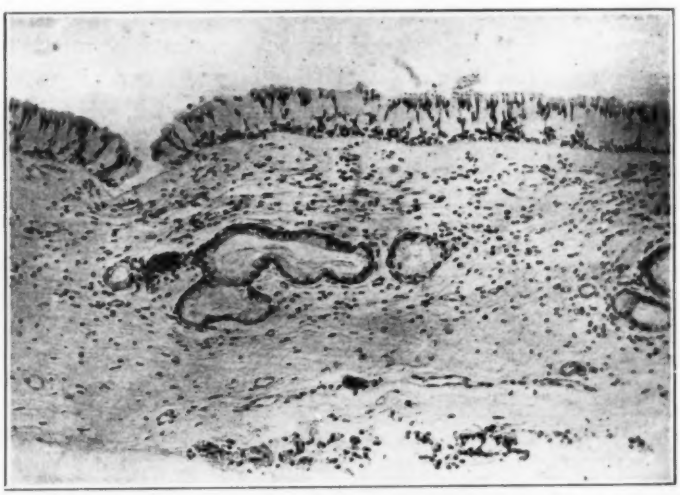

Fig. 2.—Normal human antral lining, showing ciliated columnar epithelium with many goblet cells and some gland structures in subepithelial tissue.

antrum, where there is a greater number of glands in the lining membrane (figs. 1 and 2).

Variation as to size is noticeable, as is the case in man. The maxillary sinus of the dog is not a large, deep cavity. It is an oval, rather

shallow cavity, the lateral wall of which is the maxilla and the medial wall of which is formed by the lateral ethmoidal mass, which is attached about the periphery of the oval sinus, making its naso-antral wall. The maxillary sinus is referred to by some writers as a recess, but in the specimens I have examined the recess alluded to is really made into a distinct cavity by the attachment of this lateral ethmoidal mass. The opening from the sinus into the nasal cavity is large and oval, and is close to where the ventral limb of the middle meatus joins the inferior meatus.

The sinus coincides with the last four maxillary teeth. The teeth, however, do not come up into the floor of the sinus, but are lateral to it. The infra-orbital nerve does not occupy a position as in man, but runs along in the lateral wall of the sinus. It is large and separated from the sinus itself by a plate of bone beneath which is the mucoperiosteum of the sinus.

The ethmoidal mass is large and highly developed in the dog. It projects upward into the first third of the frontal sinus, and, as previously stated, forms the medial wall of the maxillary sinus.

The frontal sinus is large and extends backward over the orbit nearly to the midpoint of the skull. It communicates with the nasal chamber by an opening almost as large as the widest diameters of the sinus above, and this opening is occupied by an extension of the ethmoid, as before stated.

So far as I have observed, the sphenoidal sinus is rudimentary in the dog.

OPERATIVE PROCEDURE

Each dog was first given ¼ grain (16 mg.) of morphine with atropine hypodermically. Twenty minutes afterward, ether was slowly administered. The usual incision was made above the line of teeth, and, after retracting the periosteum, the antrum was entered by chiseling a circular opening about three fourths of an inch in diameter. The ethmoid structures forming the medial antral wall were bitten out clear across to the septum. A sharp curved curet was now used to remove the antral lining. After this the soft structures over the canine fossa opening were held in apposition by two gut sutures. For a few days, each dog showed some swelling over the areas on which operation had been performed. In one, there was lacrimation and a moderate amount of blood-tinged discharge from the nose for three or four days. Otherwise the dogs were normal following operation.

Dog 1.—*Autopsy one month after operation.*

The opening through the maxilla was covered by a layer of somewhat resistant tissue nearly an eighth of an inch in thickness. A section of this area and of a portion of the new lining surrounding the bony opening showed, in its early stage, new fibroblastic tissue well arranged. On the surface of this newly formed tissue was a thick layer of red cells into which the new fibroblastic tissue and blood capillaries from below were making their way preparatory to replacing it. On the surface of this layer of red cells was a delicate layer of columnar ciliated epithe-

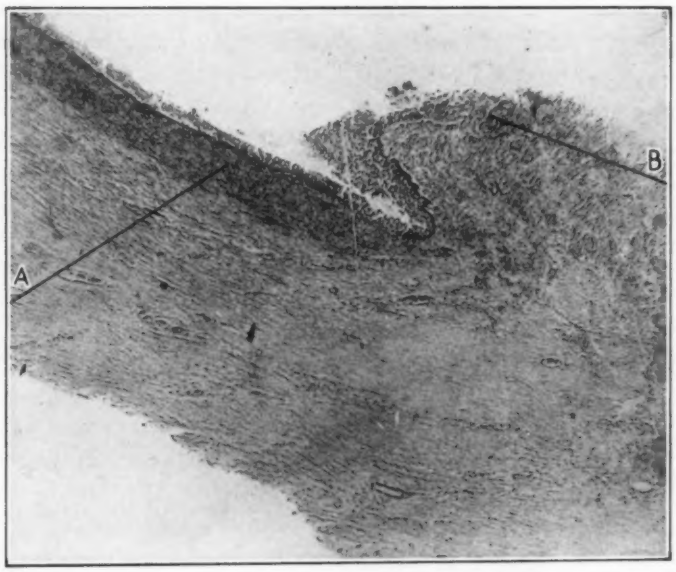

Fig. 3 (dog 1).—Section of the antral lining, showing a deep layer of organizing red blood cells covered by new ciliated columnar epithelium not as yet completely extended across the canine fossa opening. *A* indicates the deep layer of organizing red blood cells and *B*, the end of the new epithelium.

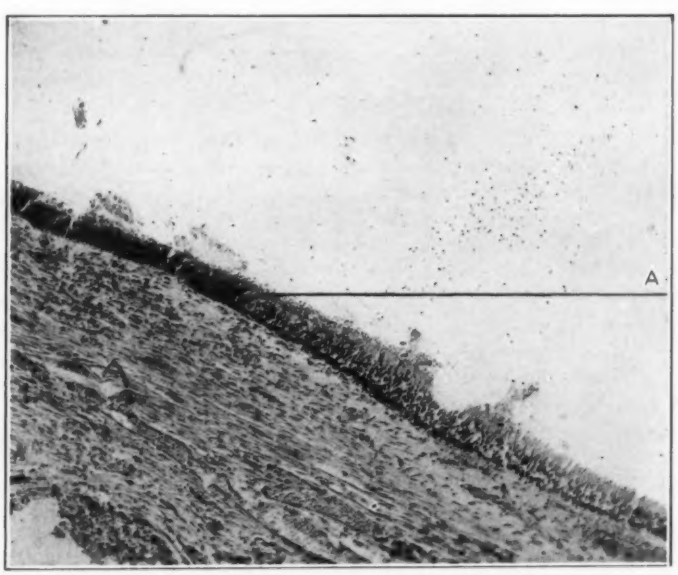

Fig. 4 (dog 1).—Section showing the point at which the new epithelium has grown out from the old, the dark being the old and the light, the new. The latter is seen to be a loosely constructed layer at this time. *A* indicates the beginning of the new epithelium.

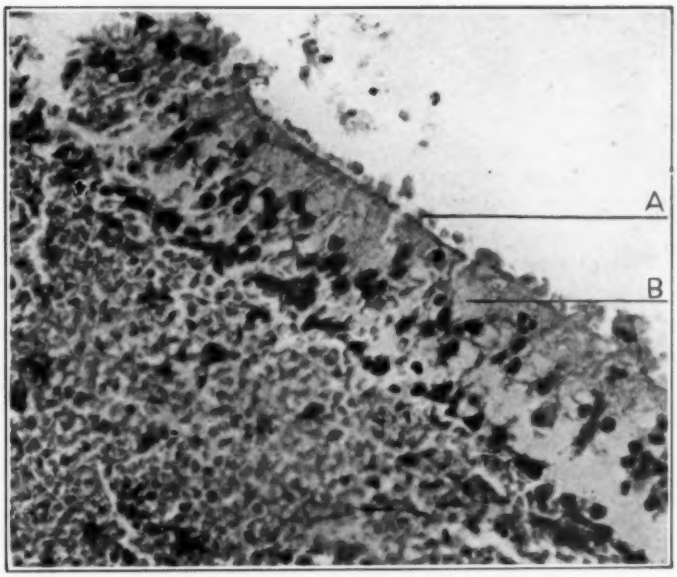

Fig. 5 (dog 1).—High power field, showing new columnar ciliated epithelium with large goblet cells growing over a mass of red blood cells. *A* indicates the cilia and *B*, the large goblet cell.

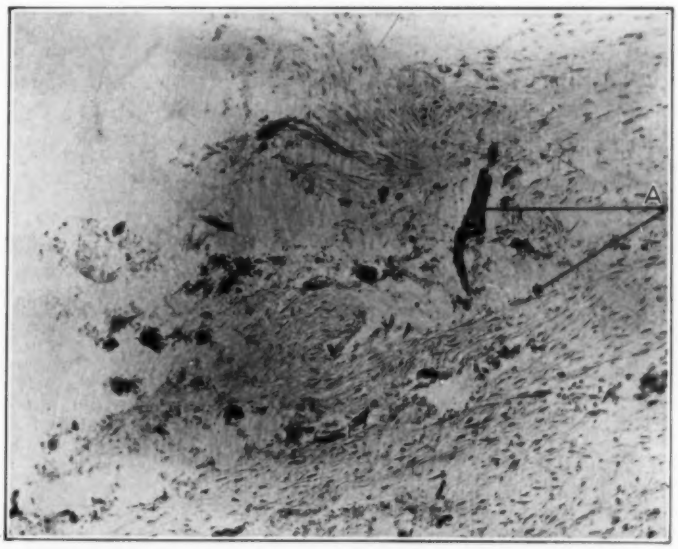

Fig. 6 (dog 1).—Section showing new bone spicules scattered promiscuously in the new fibroblastic tissue filling in the canine fossa opening. *A* indicates the bone spicules.

lium, with goblet cells already in evidence, but which had not as yet completely bridged the gap. Bone spicules and beams also were appearing at the margin of the opening (figs. 3, 4, 5 and 6).

Dog 2.—*Autopsy three months after operation.*

The canine fossa opening was nearly closed by a deposit of bone in the fibroblastic tissue. The new lining of the antrum was made up of well developed fibroblastic tissue covered with a perfectly formed columnar ciliated epithelium which showed large goblet cells. There was no vestige of gland regeneration (figs. 7, 8 and 9).

Dog 3.—*Autopsy five months after operation.*

Here, as in the preceding case, the canine fossa opening was closed, and closed completely with bone. The epithelium was a perfectly developed columnar ciliated type with large goblet cells. There was typical gland regeneration. A few collections of lymph cells resembling lymphatic nodules were seen. The subepithelial tissue was vascular. The fibroblastic tissue was now firmer, its cells approaching the adult type, and the whole antral lining was assuming the appearance of a normal mucoperiosteum (figs. 10, 11 and 12).

COMMENT

In figure 1, showing the dog's normal antral mucosa, it is noticed that there are extremely few goblet cells, but large numbers of glands, while in the normal antral mucosa of man there are fewer glands than in that of the dog, but a greater number of goblet cells.

Dog 1 presents data from which we learn how early relining of the antrum with fibroblastic tissue becomes well advanced. The eagerness with which epithelium spans the layer of reds, not even waiting for the fibroblastic tissue to displace them, is very interesting. The epithelium itself first shooting across over the reds, in a single basal layer, and then building up into a normal epithelial lining with its cilia and its goblet cells forming coincidently, is an example of what insistent nature can do and do with astonishing rapidity. This also holds true of the bone formation.

Dog 2 shows fibroblastic tissue which was, as would be expected, much more mature than in dog 1. The epithelial surface was well developed, and gave the appearance of solidity. What strikes one as particularly worthy of note was the size and number of goblet cells. They appear much larger than the usual goblet cells. It would seem reasonable to say that they, in the absence of regenerated gland structure at this time, are temporarily, at least, taking on its functions. The bone trabeculae are well developed and extend nearly across the canine fossa opening, a space of 1.5 mm. being as yet unspanned.

In dog 3, the canine fossa opening was closed by well developed bone. The entire antral lining appeared to be transforming into a normal mucoperiosteum. Scattered through this new lining were gland formations. These glands are, as Piersol stated, outgrowths from overlying

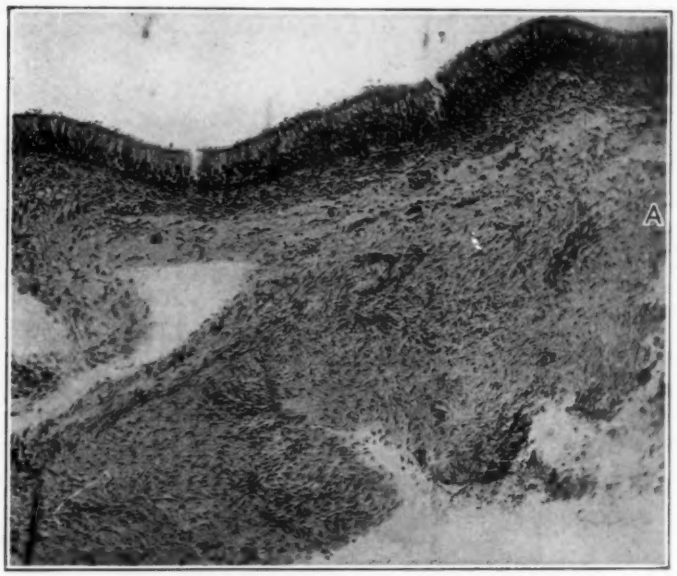

Fig. 7 (dog 2).—Section showing perfectly formed ciliated columnar epithelium with large goblet cells over a thick layer of new fibrous tissue. No glands have as yet appeared; the red cells have vanished. *A* indicates the fibroblastic tissue.

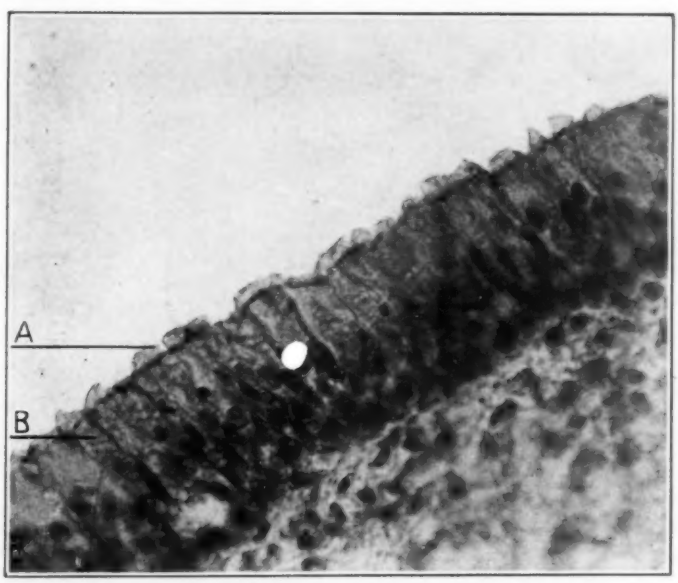

Fig. 8 (dog 2).—High power field, showing completely regenerated ciliated columnar epithelium with a great number of large goblet cells. *A* indicates the cilia and *B*, the goblet cell.

Fig. 9 (dog 2).—Section showing regenerated bone nearly closing the canine fossa opening. *A* indicates a 1.5 mm. area not yet ossified.

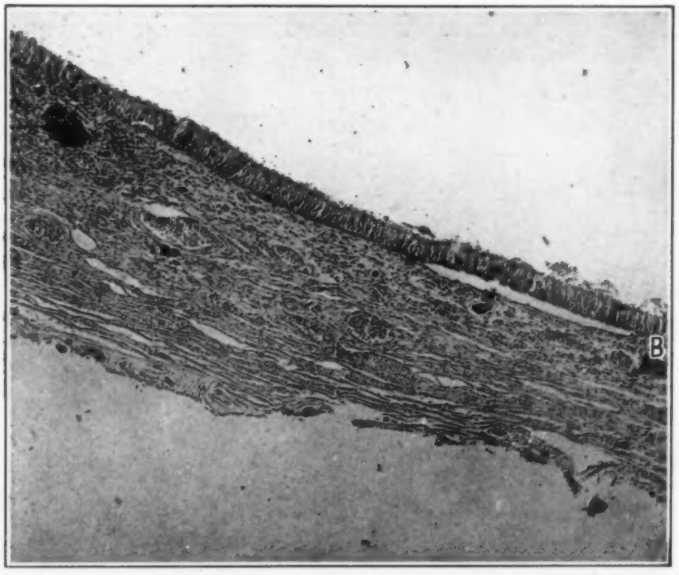

Fig. 10 (dog 3).—Section showing regenerated antrum lining with ciliated columnar epithelium, masses of lymphocytes and gland structures. *A* indicates the collection of lymphocytes and *B*, the glands.

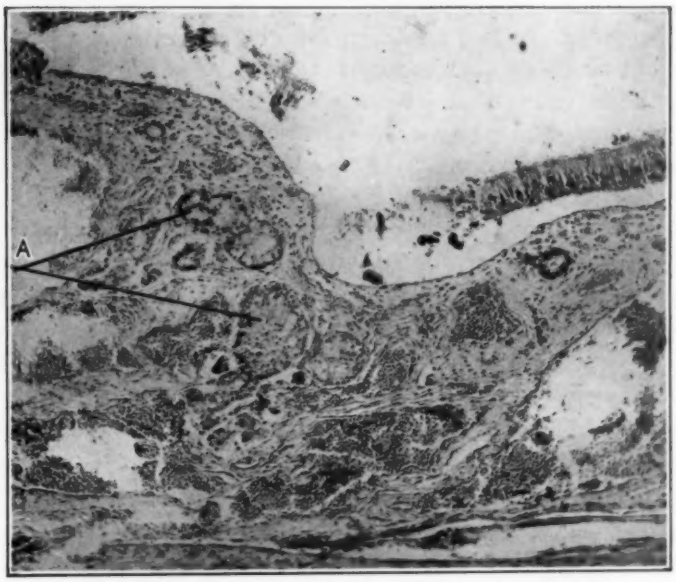

Fig. 11 (dog 3).—Section showing gland regeneration. *A* indicates glands.

Fig. 12 (dog 3).—Section showing regenerated mucoperiosteum with, among other glands, one growing down from the epithelium. *A* indicates a glandular outgrowth from the epithelium.

epithelium. The epithelial elements become modified into gland cells which assume the rôle of secretion-forming organs the products of which are discharged on the free surface to keep the latter moist.

In a circumscribed area in one of the antrums of dog 3, there was an irregular construction of new tissue. This area looked polypoid, but, on section, it was found to be a hollow structure covered, inside and out, by columnar ciliated epithelium. Possibly such an anomaly of regeneration in man might be one reason for further trouble in the antrum.

It was in the hope of witnessing gland regeneration that dog 3 was carried along. The transformation of the entire antral lining into a regenerated mucoperiosteum was certainly of much added interest (fig. 12).

CONCLUSIONS

1. Anatomically and histologically, the dog's antrum is well adapted for experimental study.

2. One month after the antral lining is removed, epithelial regeneration is well established, and bone formation begins.

3. Three months afterward, epithelial regeneration is complete, and the canine fossa opening is nearly filled in with bone.

4. Five months afterward, gland regeneration is well established, and the mucoperiosteum as a whole looks almost normal.

5. The human antral sections thus far examined show that the same processes occur in man as are here shown in the dog.

395 Commonwealth Avenue.

A NEW TECHNIC FOR THE LIGATION OF VESSELS IN TONSILLECTOMY

WALTER A. WELLS, M.D.
WASHINGTON, D. C.

A decade or so ago, the operation universally practiced for the removal of enlarged and diseased tonsils was that properly called tonsillotomy, because it consisted of only partial removal of the organ.

That this operation would prove a disappointment in failing to clear up either the local or the general infection is what might reasonably have been inferred from the consideration that the crypts in which the infective material is lodged extend through the whole depth of the tonsil to its enveloping capsule.

There was therefore devised the operation of tonsillectomy or, as it is sometimes called, enucleation, which aims at the removal of the entire organ with its capsule. At the present time, any operation that falls in any degree short of this performance is looked on as a failure.

Tonsillectomy is therefore a different undertaking from the old operation of tonsillotomy, and if properly done should be ranked as a major procedure. The operative work extends to a greater depth, involves a wider area and is concerned with more vital structures. Incomplete removal is not the only fault of unskilful work. Too much tissue as well as too little may be removed, and the unnecessary cutting into underlying muscles is an all too frequent result of awkward surgical procedures. One of the most disastrous as well as most common accidents is hemorrhage.

In the older operation, being concerned only with the vessels of the tonsil substance naturally of smaller caliber, hemorrhage came to be looked on as a negligible factor. In the modern operation, however, carrying the dissection to the roots of the arterial supply, one must be prepared to encounter vessels of menacing magnitude.

Vascular dangers may moreover be increased by reason of previous inflammatory changes and occasionally because of anatomic (oral) anomalies. Why is it then that in this operation in which the surgical principles of hemostasis are most needed, they are most neglected?

It is an old, and universally accepted axiom in general surgery that all bleeding vessels in a wound must be ligated, the wound being enlarged if necessary. If rigid injunctions are required for hemostasis by ligatures in general, they are especially needed in hemorrhage from the tonsil. In the first place the surgeon is dealing with a vascular area, in which bleeding tends to persist and is prone to recur. It often happens after tonsillectomy that there is continuous bleeding with a slow trickling of blood down the throat and into the stomach, of which the patient is unaware and which the attendant fails to recognize.

Another and an important reason for primary ligature of vessels in tonsillar surgery is the great difficulties which surround subsequent intervention. As a result of the operation the whole area has become extremely sensitive, and the patient is not in a condition to tolerate manipulations within the throat. It has happened more than once that a patient on whom an original operation was by preference performed under local anesthesia has had to submit to a general anesthetic while the bleeding was stopped on account of a postoperative hemorrhage.

Two explanations are offered for the apparent indifference concerning the obvious indications for ligature of the vessels at the time of operation; one is the extra time required, the other the difficulty of the procedure. In the effort to save time and to establish a reputation for performing the operation rapidly, not only is the welfare of the patient placed in jeopardy, but eventually time is lost instead of saved.

Postoperative hemorrhage is of much too frequent occurrence, and is usually inexcusable. It causes great distress to the patient and anxiety to his friends, not to mention embarrassment and inconvenience to the surgeon. It is a situation that can be decidedly minimized, if not practically eliminated, by the more frequent employment of ligation. The use of various styptics is generally a waste of time and effort, for, as elsewhere stated,[1] it is doubtful whether by such means the bleeding is stopped any sooner than if nothing is done. In all cases in which there is not a prompt cessation of bleeding after compression, ligation should be immediately employed.

In a recent article [2] attention was called to the fact that the arterial blood supply of the tonsil was such that buried sutures at certain specified points were a practically certain guarantee against subsequent bleeding.

It is a fact evident to any one who has performed many operations on the tonsil that the vessels do not run haphazard in all directions, over the surface of the outer hemisphere of the tonsil, but that they are confined to a small vertical strip of not more than one fourth of an inch in width. Dissection, as is known, started from either the anterior or the posterior border may proceed inward for a considerable distance before this strip is reached and vessels are encountered, whereas for the same reason dissection begun at the upper or lower pole leads at once into the vascular area.

The arteries enter the vertical strip at both its upper and its lower extremities. The largest vessel in the blood supply of the tonsil is one entering from above and usually found just within the angle formed

1. Wells, W. A.: Hemorrhage as a Complication of Tonsillectomy, Virginia M. Monthly **54**:214, 1927.

2. Wells, W. A.: Method Which Insures Practical Control of Hemorrhage in Connection with Operation of Tonsillectomy, M. J. & Rec. **126**:227, 1927.

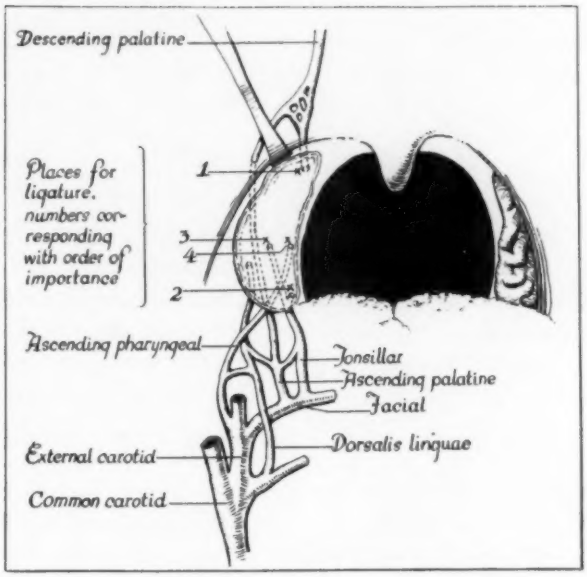

Fig. 1.—Diagrammatic scheme of the vascular blood supply of the tonsil fossa, showing common sites of bleeding.

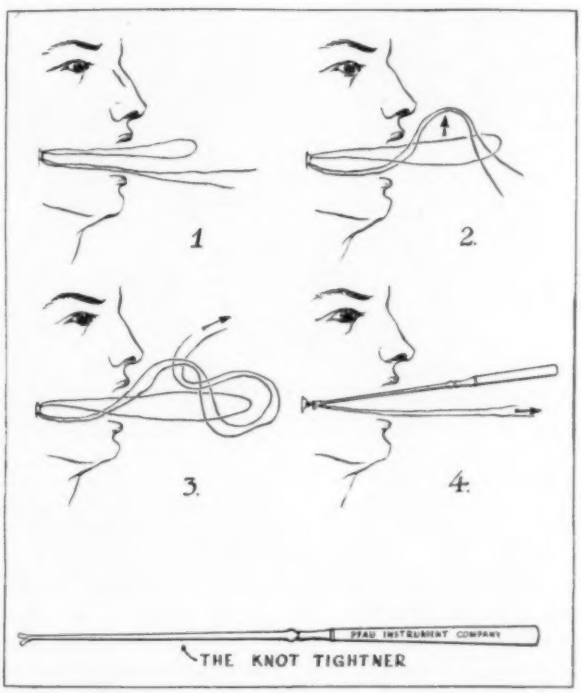

Fig. 2.—The knot tightener, with the various steps in the method of tying.

by the convergence upward of the anterior and posterior pillar. It is derived from a plexus situated above and external to the upper pole, formed by the conjunction of the ascending and descending palatine arteries; therefore this of all the points is considered the most important one for the insertion of the buried suture.

In many cases, especially of adults, the vessels entering from below may be of considerable size and may need to be ligated. These are the tonsillar branches derived from the facial artery.

A practical point to bear in mind is that when one locates a point of bleeding situated above the equator of the tonsil, it is well to place the ligature superior to this point: whereas if the bleeding point is in the lower half of the fossa of the tonsil, care should be taken to ligate below it.

NEW INSTRUMENT FOR PLACING SUTURE AND TECHNIC

For the purpose of placing the suture easily and quickly at any desired point of the fossa, I designed a special instrument which I have been using with success and much satisfaction for some time. From the general interest manifested, it was evident that this instrument filled a long felt want in work done on the tonsils, and certain modifications of the original design have been made, which, I believe, add greatly to its practical usefulness.

The most important improvement is in the needle, which has been made slenderer and of a size not greater than that of the ordinary needle used on the tonsil; it is so constructed that the open eye does not catch in the tissues. Instead of a clasp for holding the thread taut, a T-shaped piece is superimposed on the handle, and a small extension is added to the thumb piece.

The thread first made tense is wound around the horizontal bar of the T and the free ends steadied by the natural pressure of the thumb on the thumb piece. With this arrangement, fine catgut (singe 0) may be safely used without risk of snapping, and with a slight easing up of the pressure of the thumb the thread becomes automatically released. The release is facilitated if a small loop is formed beneath the thumb by twisting the free ends so that they point forward toward the needle end of the forceps.

In my method of using the instrument, I first pick up by means of the ordinary curved hemostatic forceps a generous portion of the tissue, including the vessels I wish to tie. By making a little tension so as to lift up this tissue, the ends of the suture forceps are applied to the base of the pedicle, and with the closure followed immediately by the opening of the instrument, the thread can be inserted at the point desired.

When the suture has to be placed high up in the superior angle, or in any part of the fossa hidden by an overhanging anterior pillar, it is helpful to have the assistant draw the pillar forward by means of the Hurd retractor.

In the act of opening of the forceps, the thread becomes automatically released from one end of the instrument and caught in the eye of the needle of the other, where it is held until drawn outward through the mouth to the desired length.

Thus through the tissue and under the vessel is a double thread with a loop on one side and free ends on the other. All that one then needs to do is to tie the thread. This can be done in the ordinary way if one so prefers, but for some time I have been practicing a method of tying which has the great advantage

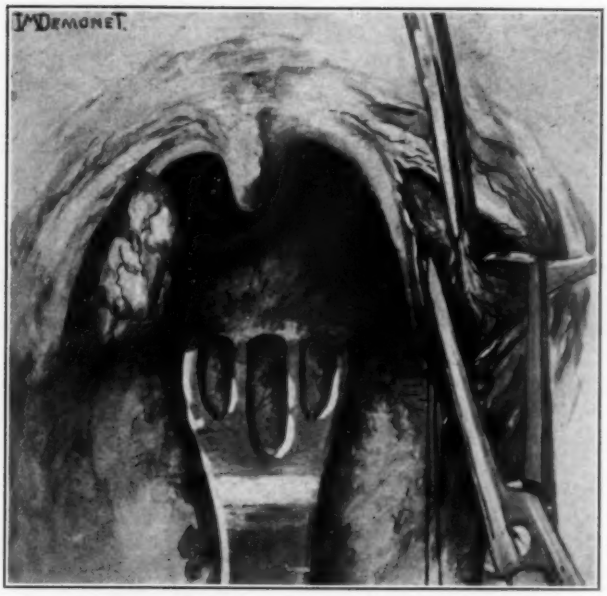

Fig. 3.—Instrument ready to place suture through the tissue previously perched up by hemostatic forceps.

Fig. 4.—The doubled thread now placed beneath vessel to be ligated. Released from the instrument on one side it is engaged in the eye of the needle on the other and is being drawn outward through the mouth preparatory to tying.

that it can be done without the operator being obliged to insert the fingers in the cavity of the mouth at any time.

For the suture material I recommend catgut single 0, which should be of sufficient length, not less than 20 inches, preferably 22. Before threading it in the suture forceps, it must be thoroughly soaked for a few minutes in sterile water to make it soft and flexible. The tie is made as follows: With the loop in one hand and the free ends in the other, a portion of the free ends part is pressed through the loop, but the free ends themselves are not carried through; thus a second loop is formed inside the first, and the free ends are carried through this second loop. A traction is then made on the free ends, which has the effect of making a sort of double slip knot, which will advance with continued traction to the point of fixation in the tissue.

In order to place the knot completely and make it firm, it may be necessary to use a simple instrument with a forklike termination, which, sliding along the thread, will carry the knot before it and serve to tighten it.

I have proved in numerous instances that this knot holds well and remains tied as long as necessary, in fact until the catgut has begun to be absorbed.

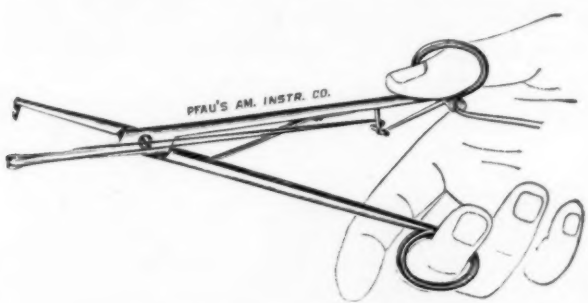

Fig. 5.—New instrument described in text.

COMMENT

The necessity of ligating being conceded in the modern operation of tonsillectomy, I believe that the method here described goes a long way in overcoming objections to this procedure on the score of either difficulties or time.

For this reason, however, it is not necessary to go to the extreme of placing sutures without discrimination in every case.

In children, ligation is rarely necessary, relatively speaking, and in many adults a clean fossa can be quickly obtained by sponge compression or by the bite of the hemostatic forceps into the tissue, the bleeding point being embraced.

But in case of unusual vascularity and persistence of bleeding, especially when high arterial tension is present, nothing should be left to chance. The little extra time and trouble are more than compensated for by the added security against a frequently occurring disagreeable and, possibly, serious accident.

ROENTGENOGRAMS OF THE SPHENOID AND ETHMOID SINUSES

THE OBLIQUE METHOD *

A. P. OVERGAARD, M.D.
OMAHA

The use of the roentgenogram in the study of the nasal accessory sinuses has become a necessity. Few will dispute this fact, although much discussion still prevails as to the method which offers the most efficient use of this aid to diagnosis. In order, if possible, to standardize the technic of roentgenology of the skull, various systems of topography have been worked out. Many of these have been too elaborate to be practical. A few positions have come into such general use that they may be regarded as standard. These produce uniformly good roentgenograms, but the diagnostic value of each is limited.

A general view of the paranasal cavities and an indication of the depth of the sphenoidal sinus are included in roentgenograms taken in the lateral position; but because the cavities of one side are directly superimposed on those of the other, the size and extent of corresponding right and left sides cannot be estimated. In such views the localization of the focus of disease in pathologic processes is impossible even when the cavities are viewed stereoscopically.

Roentgenograms taken in the vertical position are valuable in showing the separation of the sphenoids and the relation between the posterior ethmoid and the sphenoid sinuses and in bringing out the orbital recesses of the frontal sinus. But vertical views lack detail because of the distance from the object. Vertical views in Pfahler's position when the film is inserted in the mouth produce more favorable results, but the usefulness of these views is restricted because they present the sphenoid sinus isolated from its adjacent structures.

Anteroposterior views of the head in the Waters' position show both antrums, the frontal sinuses and the anterior ethmoid cells of both sides. Roentgenograms obtained in this manner are valuable for comparison of corresponding cavities, but the position is not favorable for the presentation of the sphenoid and posterior ethmoid sinuses as these cavities are hidden by the overlying anterior ethmoid sinuses. Only that part of the sphenoid sinus which lies in the direction of the olfactory rim and only those parts of the posterior ethmoid sinuses which may be seen within the orbit are visible.

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* Read before the Section on Radiology at the Seventy-Ninth Annual Session of the American Medical Association, Minneapolis, June 13, 1928.

Various modifications of standard positions have been advocated for the investigation of special areas of the head. Reliable information in the region of the sphenoid and ethmoid sinuses is the most difficult to obtain because of superimposed anatomic structures. An oblique method of presenting these sinuses was first advocated abroad. As early as 1905, Von Schuller gave out a "turned view-direction for the demonstration of the visibility of anterior skull-cavities." Such roentgenograms proved to have diagnostic value by conveying comparative information and well marked detail.

A similar method demonstrated by Rhese [1] in 1910 was at once recognized as definitely superior to those in general use. Sonnenkalb [2] said of it: "Rhese alone has the distinction of having found a view-direction in which both sides of the sphenoids and ethmoids are superimposed only in part and in ideal whiteness are projected on the plate to their whole extent. The strong bone-partitions which lie behind the eye-cavities are avoided and the region under consideration suffers no obscuring from overlying masses."

The Rhese position is employed to obtain an oblique view of the skull; the plate is fastened onto the face and the ray is directed from the opposite parietal region so as to project the optic foramen into the middle of the orbital cavity. If the position is correctly estimated, the optic foramen will occupy the center of the orbit, and to the outer side will be seen the sphenoidal fissure. Toward the meridian line is projected the sphenoid sinus, anterior to the optic foramen; above this will be seen the upper brim of the orbit and above the orbit the frontal sinuses. In expounding his method, Rhese said: [3] "It is understood that this is not an oblique posterior-anterior view. The plane of the plate is turned twenty to thirty degrees around from the frontal position. I thus get rid of the thick skull bones at the back of the head. The thin lamina papyracea and the lateral sphenoid wall are the only bone parts which lie between the plate and the questionable cavities."

Oblique views similar to those advocated by Rhese have been demonstrated in this country by Pfahler [4] and Iglauer.[5] This method was

1. Rhese: Die Diagnose der Erkrankungen des Siebbeinlabyrinthes und der Keilbeinhöhlen das Röntgenverfahren, Deutsche med. Wchnschr., January, 1910.

2. Sonnenkalb: Roentgendiagnostik der Nasen und Ohrenarztes, Jena, G. Fischer, 1914, p. 76.

3. Rhese: Die chronischen Entzündungen der Siebbeinzellen und der Keilbeinhöhle, Arch. f. Laryng. u. Rhinol. **24**:401, 1910.

4. Pfahler: New Technique for the Sphenoid, Laryngoscope **26**:1018 (July) 1916.

5. Iglauer, S.: Oblique Method of Roentgenography of the Ethmoid and Sphenoid Cells, J. A. M. A. **67**:1905 (Dec. 23) 1916.

first called to my attention by Dr. W. P. Wherry,[6] to whom I am indebted for valuable cooperation and advice. In passing, I wish to emphasize the importance of close cooperation between the roentgenologist and rhinologist. Inestimable advantages are to be derived from discussion of operative and clinical observations.

ILLUSTRATIONS

Using the Rhese method as a foundation, I worked with a dried skull and with living subjects to develop a definite technic. The accompanying illustrations show this procedure and some of the problems involved.

Fig. 1.—Roentgenographic appearance with skull in Rhese position.

In figure 1, the skull has been turned a few degrees to displace the optic foramen forward. As a result, the ethmoid field is brought out in relief, but the ethmofrontal sinus has been covered by the nasal bones and the frontal processes of the superior maxilla. The petrous portion of each temporal bone should be noted. That of the same side extending posteriorly is seen in its longitudinal axis and is identified by small shot on the superior surface, while that of the opposite side is seen in cross-section just below the sphenoid region and is identified by large shot showing faintly.

6. Wherry, W. P.: Value of Roentgen Ray in Rhinologic Diagnoses, Arch. Otolaryng. **3**:1 (Jan.) 1926.

Figure 2 shows small shot placed in the sphenoid cavity, a fine mesh screen placed over the left ethmoid region and a heavy mesh wire placed over the right ethmoid region. When the skull is placed in the oblique position, the heavy mesh wire is over the lower edge of the fine mesh wire. In some cases, this overlapping is pronounced, but the use of the stereoscope clears the field and shows how the right side is below and nearer the eye than the left side. Three large shots are placed in the right frontal cavity; the left frontal cavity is empty.

Figure 3 shows the proper position of the skull, and the flat surface of the superior wall of the sphenoid sinus is prevented from interfering with the presentation. The optic foramen is somewhat distorted in contour but is in its proper position and rests on the orbital rim. Barium paste of different densities was used to stimulate the shadows of the living tissue in the ethmoid-sphenoidal field.

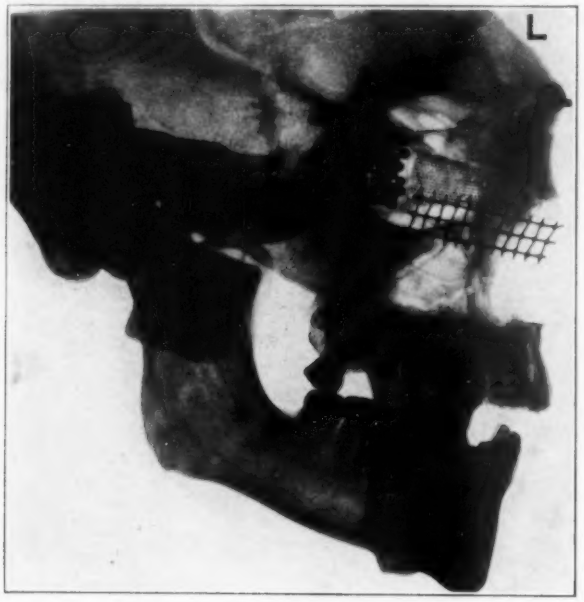

Fig. 2.—Left ethmoids outlined by wire mesh; right ethmoids outlined by heavy wire; sphenoids outlined by small shot; right frontal sinus outlined by large shot.

This can best be illustrated stereoscopically, as a flat view does not show any contrast.

Figure 4 shows the correct position of the skull with the ethmoid and sphenoid sinuses filled with barium paste. Strips of tin are pasted onto the superior surface of the petrous portion of the temporal bone. Small narrow strips are used on the left side and wide strips on the right side. Circular platelets are used to outline the boundary of the left antrum. The antrum of the opposite side is placed forward as it is in the tip of the nose with the malar bone and nasal border of the superior maxilla overlapping, while the antrum on the same side as the ethmoid sinuses is posterior and down behind the petrous portion which overlaps the sphenoid, but the stereoscopic view shows the shadow of the petrous portion of the temporal bone to be on the opposite side of the skull.

As a result of experimental work and of actual experience in a large number of cases, the method was developed which I now use as a routine in the examination of sphenoid and ethmoid sinuses. It differs in several particulars from the original Rhese position. A more comprehensive view is afforded of the section, and the landmarks established make possible accurate duplication of roentgenograms.

My technic is as follows: The patient lies prone on the table with a firm pillow under the chest (fig. 5). The side of the head to be exposed rests on an 8 by 10

Fig. 3.—Sphenoids and ethmoids outlined by barium paste.

plate-changer which stands about 2 inches high on the table. The head is placed so that the malar bone process, the superior margin of the orbit and the tip of the nose rest on the plate-changer. A ⅝ inch rubber block is placed under the chin, and the head is further immobilized by head supports. The position is natural, and it is easy for the patient to maintain the head at the proper angle. A lead shield is used on the plate-changer so that both the right and the left views are included on one 8 by 10 roentgenogram. The x-ray tube is then adjusted for horizontal stereoscopic exposures and the ray directed obliquely through the head, perpendicular to the cassette and centering on the orbital cavity.

This method, I believe, has advantages which make it the most important diagnostic aid available in disease of the sphenoid and posterior ethmoid sinuses and for the differential diagnosis of diseases of the anterior and posterior ethmoid sinuses. Its overwhelming advantage over other positions lies in the fact that it presents the sinuses in practically their anteroposterior dimensions and allows a study of the separate cells and ready identification of the structures in question. Since the exposure is made through tissues of slight density and since the parts are projected into a clear field, namely, the orbital cavity, types of tissue changes, both suppurative and nonsuppurative, are easily recog-

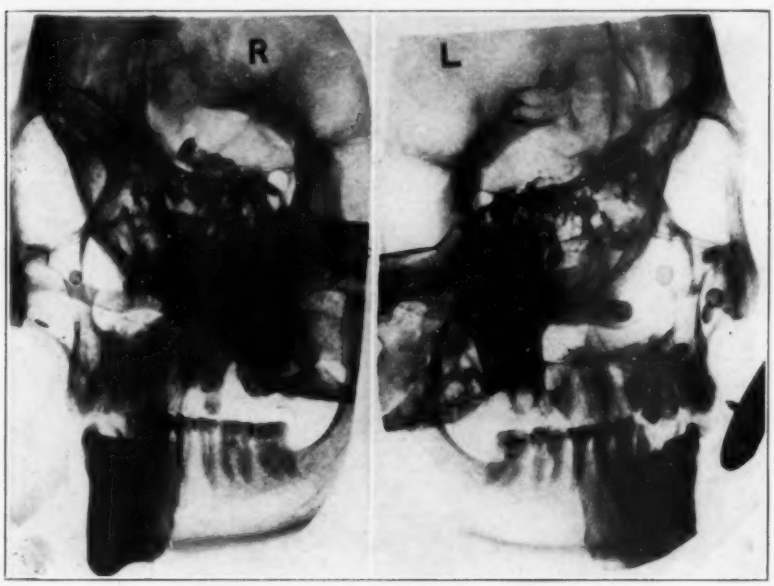

Fig. 4.—Ethmoids and sphenoids outlined by barium paste; a small strip of metal is placed over the petrous portion of the temporal bone.

nized. Boundaries of the cavities are sharply marked so that when they are faded or obliterated, the condition is understood to be a sign of disease. In the section in which the cavities overlap, the oblique position causes separation of the two halves to be carried all the way through and when viewed stereoscopically, determines the dimensions of each half.

When oblique roentgenograms are read, the recognition of lines and shadows is facilitated if one visualizes the ethmoid and sphenoid cavities projected on the median wall of the orbit to which they are adjacent. One realizes that in the position of the head described, the orbital rim of the side to be shown hangs about horizontally over the film. This

orbit circle stands out clearly in the roentgenogram, and within it may be seen the shadow of the ethmoid and sphenoid sinuses.

Figure 6 makes clear the exact location of the ethmoid and sphenoid cavities on the roentgenogram and their relation to other structures of the head. One looks for landmarks that will assist in interpretation. First, one sees that the optic

Fig. 5.—Patient in proper position for the oblique view of the ethmoids and sphenoids.

foramen rests on the posterior rim of the orbit circle. Second, a horizontal line (7) marks the boundary between the frontal bone and the lamina papyracea. This well marked line is directed slightly downward, then upward as it progresses forward toward the ethmofrontal region. From it, two oblique lines extend downward. Of these, line 8 marks the boundary between the posterior ethmoid cells and the sphenoid sinus. Line 9, which marks the division between the anterior and posterior

ethmoid sinuses, is not so clearly defined on a roentgenogram. In the forward part of the sphenoid sinus one finds delicate lines which correspond to the posterior ethmoid cells and which slightly overlap. The anterior ethmoid cells extend under line 7 forward toward the frontal sinus and the bridge of the nose. The petrous portion of the opposite temporal bone covers in part the lower border of the sphenoid sinuses.

The interpretation of a roentgenogram is complicated when comparison with the cavity of the other side shows differences in local development which cause the two cavities to appear dissimilar and without proper relationship. In all cavities in the skull and especially in

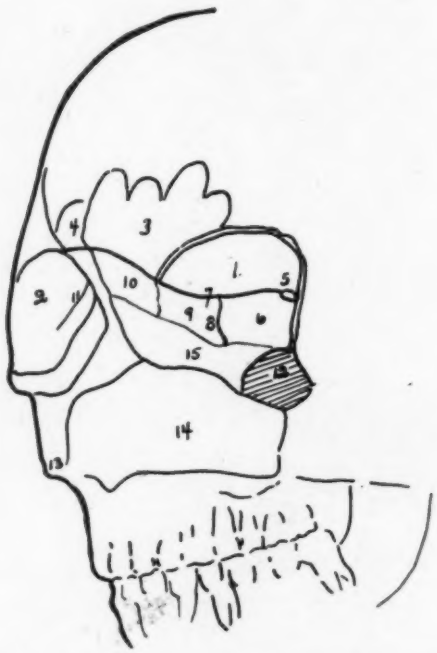

Fig. 6.—Diagram of the skull, showing the relation of the sphenoid and ethmoids to other structures of the head. 1 is the right orbit; 2, the left orbit; 3, the right frontal sinus; 4, the left frontal sinus; 5, the right optic foramen; 6, the right sphenoid; 7, the ethmoid roof line; 8, septum between the sphenoid and ethmoid; 9, right posterior ethmoid cells; 10, right anterior ethmoid cells; 11, bridge of nose; 12, petrous portion of left temporal bone; 13, left zygomatic process; 14, right antrum; 15, left ethmoid cells.

those in the region of the sphenoid and ethmoid sinuses frequent differences exist. They occur in the thickness of bone walls as deformities or as a result of previous operations. Deviations, ridges, perforations, instances of atrophied processes of the mucous membrane and ossification of the parts are found. These faults in the anatomic formation of sinus cavities may be mistaken for pathologic conditions. Unerupted

third molar teeth may simulate disease of the sinuses, as may ossified or otherwise abnormal ethmoids or enlarged anterior ends of the turbinated bones. The ethmoid shadow may fall into the lower part of the frontal sinus and thus simulate a frontal sinus when the sinus is missing.[7]

Much misunderstanding arises from wrong interpretation of good roentgenograms because of the lack of understanding of the anatomic relation of the bones of the head and their relative position when superimposed. Interpretation has been the great stumbling block in working out a definite technic, as one is bound to find overlapping of parts of the skull and overlapping shadows. But the solution for these difficulties is the stereoscopic presentation of oblique roentgenograms because this makes it possible to examine the cavities in relief.

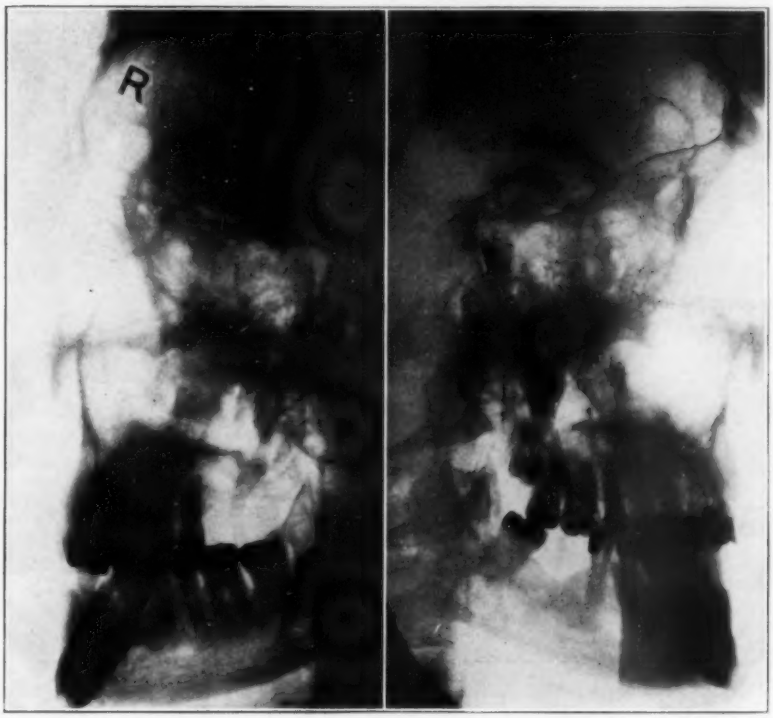

Fig. 7.—Ethmoids and sphenoids cloudy, three plus; unerupted third molars.

In a man, aged 54, stereoroentgenologic examination (fig. 7) showed: ethmoid and sphenoid sinuses cloudy, three plus; left upper and right lower third molars unerupted and pressing on the second molars. Removal of the teeth was recommended. The rhinologist's examination showed that the right ethmoid intercellular

7. Rieder and Rosenthal: Lehrbuch der Röntgenkunde, vol. 2, p. 599.

elements were polypoid degeneration and free pus; none was found in the sphenoid but the mucosa was the same type as that of the ethmoid; the left side was the same as the right but the condition was not so far advanced; an alveolar abscess was present on the left side, involving the left antrum.

In a woman, aged 21, stereoroentgenologic examination (fig. 8) showed: ethmoid and sphenoid sinuses cloudy, two plus; the right and left upper third molars were unerupted and appeared to be pressing on the second molars; the left lower third molar was unerupted and in a transverse position, with an abscess. Removal of the teeth was recommended. The rhinologist's examination showed low grade ethmoiditis, yielding to treatment; the unerupted third molars were removed.

Fig. 8.—Ethmoids and sphenoids cloudy, two plus; left lower third molar unerupted and in a transverse position.

CONCLUSIONS

1. Roentgenograms taken in the oblique position cause little overlapping of anatomic structures.

2. Both the right and the left side can be examined at the same time; this is a big aid in differentiating pathologic changes.

3. Molar teeth are clearly demonstrated.

4. Definite landmarks make oblique views capable of uniform duplication.

5. Stereoscopic views are essential for accurate diagnosis.

1412 Medical Arts Building.

ABSTRACT OF DISCUSSION

DR. M. J. HUBENY, Chicago: My experience with sphenoidal examinations has been disappointing, even more so than the failure to show gallstones. I have not tried the stereoscopic method but shall do so in order to evaluate it. Oblique projection has interested me since 1912, when Dr. Pfahler amplified Dr. Rhese's work. I have been doing it as a routine in sphenoid work, using other projections as well. Dr. Overgaard enumerated the physical difficulties with which one has to deal, such as superposition of parts and great densities and distance between the film and the part to be examined. There are so many variations in size, shape and position of the cells that it will be difficult at all times to make a satisfactory diagnosis. The clinical aspect is exceedingly interesting and confusing, because the contiguous symptoms will be influenced by the degree of cell excavation. If the cells extend into the lesser wing and into the clinoids, one might find a predominance of optic symptoms; if the cells extend into the dorsum of the sella, pituitary symptoms are possible. Should they extend into the pterygoid bones or to the antero-inferior angle one encounters added difficulties, because the question of drainage, which is the vital problem, becomes still worse, as the ostium is usually highly situated. In other words, from the standpoint of roentgen diagnosis, the physical problem is much against us, and I think that our method will always have distinct limitations. However, this does not mean that a complete examination should not be made; on the contrary, it should be made. I should like to sound a warning. One attempts to make a differential diagnosis; in my own experience, I have chiefly confined my conclusions to stating the presence of opacities, not feeling competent to recognize with any degree of satisfaction an inflammatory process due to a catarrhal or purulent condition or, if the condition is infective, to tell whether it is tuberculosis or syphilis or, if it is a new growth, what kind it is.

DR. G. E. PFAHLER, Philadelphia: In 1912, Dr. Skinner and I became interested in this subject and at that time we were not familiar with the work of Rhese, which is almost a duplication. Every different angle at which one can examine any of the accessory sinuses will give additional information. It is hard to get all of the information from any one physical examination. I believe, therefore, that this oblique position is of definite value. I, myself, have found it extremely difficult of interpretation, and I have come to depend more on the anteroposterior, lateral and vertical positions to give me my information and have used the oblique method more in a supplementary way. The anteroposterior and the lateral positions are, of course, used as a routine. The vertical position, that is, the use of the film placed in the roof of the mouth projecting the sphenoid and ethmoid sinuses down onto the film, I discussed in 1916. I am still using that method, and I think that it is valuable because the film is almost in contact with the sphenoid and ethmoid cells; more recently, I have become even more interested in the film projection from the submental-vertex region, in which the film is put on top of the head, practically, and the rays sent up through the larynx, approximately; this gives one the additional relations of the other cells and presents the two series of sinuses on each side for comparison. I believe that there is as much variation in the sphenoid sinuses as there is in a man's face. No two are alike, and, therefore, it becomes extremely difficult to utilize this oblique position by itself, unless one checks up with the other three planes; if one wants to get all the information, it will have to be done this way and stereoscopic pictures made in each position, though it will add to the amount of work.

DR. OVERGAARD: I want to emphasize the relation of the third molar teeth to the sinus complex. In the twelve years that I have been doing this work, I have had between 4,000 and 5,000 cases, but an estimate has not been made of how many

third molars have been found in which there were no particular symptoms indicating infection of the roots; however, they are a big factor in many cases. In routine work, I use both the oblique and the Waters' positions. These two combined, taken stereoscopically, give a complete view of antrums and frontal, ethmoid and sphenoid sinuses and, in addition, information about the molar teeth.

In my report to the rhinologist, I use the numbers one, two, three and four plus. One and two indicate the presence of an inflammatory condition. Three and four indicate the presence of free pus. The roentgenologist should not make a definite statement to the patient of his observations but should work in close cooperation with the rhinologist and leave him free to discuss the condition with the patient. The only objection I have to the vertical position employed by Dr. Pfahler is that a number of the patients are children or elderly people, and it is physically impossible to get them in the proper position in order to get under the chin and place the film on top of the head in the proper manner.

FOREIGN BODIES IN THE STOMACH AND IN THE INTESTINES *

M. C. MYERSON, M.D.
Associate Laryngologist, The Mount Sinai Hospital
NEW YORK

Gastrotomy is frequently performed when it might be avoided. Persons who swallow foreign bodies are usually referred to the laryngologist first. When the foreign body is no longer in a position for esophagoscopy, the question of its future management arises. The laryngologist, by virtue of his more frequent contact with these cases, should be able to determine the best procedure. He should determine whether gastroscopy or surgical measures are to be employed, or whether the foreign body should be permitted to pass through the bowel tract unmolested.

Heretofore, this field has been covered principally by the surgeons. Because of its importance to the laryngologist, he should have an understanding of the various phases of foreign bodies in the stomach and intestines. When the laryngologist is consulted and he finds that the foreign body is no longer in a position to be removed by him, he should be able to advise concerning the future behavior of the foreign body. He should also be able to direct the future care of the patient.

Little is generally known of what becomes of a foreign body when it reaches the stomach. The attending physician frequently joins with the family in its alarm when one of its members swallows a foreign body such as a coin, a pin or a nail. This alarm frequently leads to the performance of unnecessary or untimely surgical measures for the removal of the object. Much has been written concerning isolated instances of perforation of a portion of the gastro-intestinal tract.[1]

When a foreign body lodges in the stomach, there are four possibilities which must be considered. First, the foreign body may be regurgitated into the esophagus or even out of it, as occasionally occurs. Second, it may pass through the pylorus, or it may remain in the stomach because of its size and shape or because of an abnormally small pylorus. The third possibility, which is remote and of extremely rare occur-

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* Read before the American Laryngological Association, Washington, D. C., May 2, 1928.

1. Some striking examples are reported in the following references: Carp, Louis: Foreign Body in the Intestine; Perforation; Recovery After Operation, Internat. Clin. **4**:190, 1923. Allen, E. S.: Foreign Bodies Perforating the Intestinal Tract, Kentucky M. J. **23**:18 (Jan.) 1925. Lupton, W. J. E.: Another Case of Foreign Body Inadvertently Swallowed, Lancet **213**:1179 (Dec. 3) 1927. Eiselberg, A.: Foreign Bodies in the Stomach, Internat. Clin. **4**:45 (Dec.) 1926.

rence, is that the foreign body may perforate the wall of the stomach. When the foreign body passes through the pylorus, it will be likely to pass through the intestinal tract and be evacuated with the stool. In an exceptional case, it may lodge in the appendix or perforate the intestinal wall.

Perhaps the most unique experience encountered by the endoscopist occurs when a foreign body is regurgitated into the esophagus or even out of it. Those that return to the esophagus are removed by the esophagoscopist. I have found four recorded instances in which an open safety-pin was returned to the esophagus with the ring end uppermost, and then was removed esophagoscopically.[2] Foreign bodies that remain in the stomach and cause distress are removed by either the gastroscopist or the surgeon, while those that pass through the pylorus usually pass through the bowel tract. Pointed foreign bodies should be closely watched until they have passed. There are comparatively few recorded instances in which foreign bodies which were under observation, caused a perforation. It is noteworthy that in a majority of the instances of perforation caused by foreign bodies, there was no definite history of the ingestion of a foreign body. Fowler[3] reviewed the literature on appendicitis due to foreign bodies, and made note of the fact that in only five of sixty-three cases was there a history of a foreign body having been swallowed. Ginzburg and Beller[4] reported fifteen cases of different types of surgical complications caused by foreign bodies in the intestines. In none of these cases did the patient know that he had swallowed a foreign body. The fish bone, one of the most common of foreign bodies, is often swallowed unknowingly. Its presence may never be known. The experiments of Faber[5] with foreign bodies of this class are interesting. He found that fish bones, fed to persons with a normal or hyperacidity, did not appear in the stools, showing that they are decalcified in the normal process of gastric digestion.

At first thought, it would appear that any foreign body which passes through the cardia should also pass through the pylorus, if it were not for the unusual size and shape of some objects, or possibly an abnormally small pylorus. A single foreign body will remain in the stomach because

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2. Recorded by Jackson, C., and Spencer, W. H.: Safety Pins in the Stomach, J. A. M. A. **76**:577 (Feb. 26) 1921. Taylor, J. M.: Ingested Foreign Body, Arch. Pediat. **40**:557 (Aug.) 1923. Iglauer, S.: Open Safety Pin in the Stomach, then Point Downward in the Esophagus Removed, Ann. Otol. Rhin. Laryngol. **36**:1164 (Dec.) 1927. Orton, H. B.: Auto Expulsion of Foreign Body, Laryngoscope **37**:838 (Nov.) 1927.

3. Fowler, R. H.: Foreign Body Appendicitis, Ann. Surg. **56**:427, 1912.

4. Ginzburg, L., and Beller, A. J.: The Clinical Manifestations of Non-Metallic Perforating Intestinal Foreign Bodies, Ann. Surg. **86**:928, 1927.

5. Faber, Knud: Ueber Graeten als Fremdkoerper im Darm und ueber Knochenverdauung, Berlin klin. Wchnschr. **35**:768 (Aug. 29) 1898.

it is too large to pass. Multiple foreign bodies may be small enough to pass individually, but frequently they form an entangling, obstructing mass which is too large to be propelled through the pylorus. This class of case is seen among insane persons, or among the professional swallowers.[6] Stomachs of the latter have been emptied of an unusual content. Thorek [7] reported the case of an actor, aged 24, whose stomach, on being opened, yielded a total of 276 foreign bodies, including nails, tacks, clips and open and closed safety pins. Griffith [8] reported the case of a man, aged 29, whose stomach contained 1½ pounds (0.75 Kg.) of assorted hooks, pieces of wire and hair pins. Benjamin's [9] patient was a glass and nail eater. Fifty-two nails and five pieces of glass were removed from his stomach. Occasionally, a woman is encountered who unconsciously swallows her hair. As a result, she suffers from a matted collection of hairs in her stomach which in time can form a cast of that organ. Balfour's [10] patient had a stomach completely filled with a hair ball.

The experiences of normal human beings is more interesting, especially of children under the age of 10. One is astonished at the numbers and types of foreign bodies, which instead of remaining in the stomach, not only pass out of it, but also pass through the entire intestinal tract. There are several reports of cases in which pointed and sharp foreign bodies ran the gamut of the intestinal kinks and movements, to emerge with the stool without causing injury to the patient. Allison's [11] case is most striking. A man, aged 30, swallowed a piece of a razor blade which traversed the intestinal tract and was evacuated within forty-eight hours. Carp's series includes the case of a boy, aged 6, who swallowed a nail 3 inches in length. The nail reached the cecum on the second day, and remained there for three weeks. It was passed with a barium enema. Professional swallowers place in their stomachs nails, screws, tacks, pieces of glass, pins and such objects, and pass them by rectum.

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6. Lupton (footnote 1, third reference). Thorek, M.: Large Collection of Foreign Bodies in the Stomach, Internat. Clin. **3**:282 (Sept.) 1924. Adams, Wilmot: Two Cases of Foreign Body in the Gastrointestinal Tract, Brit. J. Surg. **13**:189 (July) 1925. Griffith, J. D.: Foreign Bodies in the Stomach, J. A. M. A. **82**:31 (Jan. 5) 1924. Benjamin, A. E.: Report of a Case in which a Large Number of Foreign Bodies Were Removed from the Stomach, Ann Surg. **45**:238, 1907. Brand, A. G.: Foreign Bodies in the Stomach Removed by Operation, Brit. M. J. **1**:1018 (June 16) 1923.

7. Thorek (footnote 6, second reference).

8. Griffith (footnote 6, fourth reference).

9. Benjamin (footnote 6, fifth reference).

10. Balfour, D. C.: Lesions of the Stomach and Duodenum, S. Clin. N. Amer. **6**:1175 (Oct.) 1926.

11. Allison, S. F.: A Case of Foreign Body Inadvertently Swallowed, Lancet **213**:968 (Nov. 5) 1927.

They come to grief, however, when a collection of these articles remains in the stomach and forms an obstructing mass. Safety-pins, both closed and open, are being swallowed more frequently than is known, and are found in the baby's diaper with the stool by the unsuspecting mother. In the case of four open safety-pins of comparatively large size which were impacted in the esophagus of an infant, Jackson [12] removed two endoscopically and pushed the other two into the stomach. They passed through the bowel without incident.

Experience has shown that foreign bodies usually travel through the intestinal tract with the heavier end foremost. This is demonstrated by roentgen-ray studies in cases in which metallic foreign bodies are swallowed, and was proved by the experiments of Exner.[13] Exner fed a dog fifty needles with his food. He introduced the needles, half pointing in the direction of the intestinal current and half pointing in the opposite direction. At the end of twenty-four hours, he found that forty-eight needles had passed with the heavier ends first. In another experiment, he introduced into the stomachs of a group of cats and dogs, 800 needles with points foremost. Seventy per cent of the needles were passed with the heavier ends first.

Carp [14] considered the reasons for the passage of a pointed object through the intestinal tract with the heavier end first. He drew conclusions from the relations which such a body may have to the intestinal current, the fecal mass and the intestinal wall, during its passage. Exner, and later Carp, demonstrated that there was a protective reaction on the part of the mucous membrane when a point strikes it.

Open safety-pins almost invariably travel along the intestinal tract with the ring or closed end first. It appears to me that the compressing action of the intestinal walls on the open safety-pin is the factor which propels it along the smaller bowel tract, and that the current of the larger bowel carries the pin along with it. Although the following simple experiments do not duplicate the conditions which obtain in the intestinal tract while an open safety-pin is passing through it, they are mentioned because the phenomena which they present are interesting.

I took a variety of open safety-pins and pieces of rubber tubing of different sizes. I found that if pressure was directed from behind against the sides of the tube in which the safety-pin was resting ring end foremost, the pin would be propelled forward (fig. 1). If the pin was too large for the tube, it would remain wedged within it and there would be an attempt at rotation in an horizontal plane. If the pin was placed

12. Jackson, C.: Four Open Safety-Pins in the Esophagus, J. A. M. A. **81:** 1094 (Sept. 29) 1923.

13. Exner, A.: Wie Schuetzt sich der Verdauungstract vor Verletzungen durch Spitzd Fremdkoerper, Arch. f. d. Ges. Physiol. **89:**253, 1902.

14. Carp: Foreign Bodies in the Intestine, Ann. Surg. **81:**575 (Jan.) 1925.

point end forward and was small enough to turn over so that the pointed end would be behind, this would occur when pressure was made on the sides of the tube behind the point of lodgment of the pin. If the pin was too large to turn over as described, it would rotate and remain in the same place inside of the tube. It is exceedingly unusual for foreign bodies to remain in the intestinal tract for a comparatively long time. Smith [15] reported the case of a woman who passed a darning needle twenty years after she had swallowed it. Carp's patient carried a nail 3 inches in length in his cecum for three weeks. The patient in case 39 of this series was so ill that the safety-pin was temporarily forgotten, and it was not passed for more than two months from the time of its

TABLE 1.—*Analysis of Thirty-Nine Cases of Foreign Body in the Stomach and Intestines*

Pins of various types	14
Open safety-pins	9
Tacks	4
Nails	4
Coins	3
Closed safety-pins	2
Clips	2
Staple	1

22 of the 39 were pointed
36 of the 39 were passed, the other 3 were removed by operation

TABLE 2.—*Analysis of Thirty-Nine Cases According to Age (Males, 22; Females, 17)*

Under 1 year	9
1 to 5 years	12
6 to 10 years	11
11 to 20 years	6
Over 20 years	1

Ages ranged between 6 weeks and 36 years
32, or 82 per cent were under 10 years of age

ingestion. A patient of Jackson and Spencer, a child, had two interlocked, closed safety-pins in the stomach for seven weeks. These were removed by Jackson by means of the gastroscope.

An analysis of thirty-nine cases of foreign body in the stomach and intestines is given in tables 1 and 2. The first thirty-one cases are from the surgical services of the Mount Sinai Hospital during a period of seven years. The eight additional cases are from my experiences and contacts. In each case, the patient applied for medical attention shortly after having swallowed the foreign body.

It is significant that thirty-six of the thirty-nine foreign bodies were passed with the stool. The remaining three were removed from the stomach by surgeons. The fact that so many of the foreign bodies passed

15. Smith, H.: A Needle in the Alimentary Canal, Brit. M. J. **1**:81 (Jan. 17) 1920.

through the bowel tract without incident, even though 82 per cent were pointed, demonstrates that the presence of a foreign body need not be cause for alarm. It would indicate that the patient could be watched and that surgical measures need not be resorted to unless a positive indication should arise.

REPORT OF CASES

The following cases are mentioned briefly:

CASE 21.—A boy, aged 15 months, swallowed an open safety-pin. X-ray study demonstrated the presence of the pin in the stomach. Gastrotomy was performed shortly after the patient was admitted to the hospital, but the pin was not found in the stomach. The course of travel of the safety pin through the bowel tract was

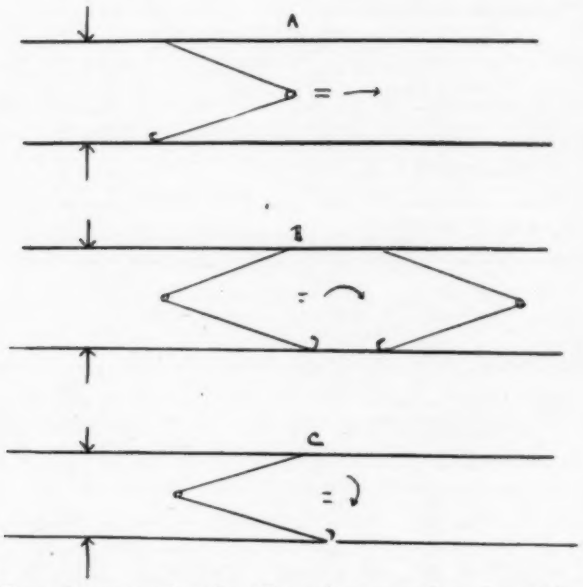

Fig. 1.—Chart demonstrating the effect of compression of a rubber tube in an attempt to propel the open safety-pin. *A* indicates that the pin is propelled; *B*, that the pin turns a somersault and is propelled, and *C* that the tube is too small and the pin rotates horizontally.

watched daily. On the fourth day, it could be seen in the sigmoid; on the next day the x-ray film failed to demonstrate the presence of the pin. In this case, the operative observations or rather the lack of them at operation, and the subsequent course, demonstrated that operation was not necessary.

On the other hand, the following case demonstrates the proper handling by the surgeon of an infant with an open safety-pin in the stomach.

CASE 22.—A boy, aged 4 months, was admitted to the hospital after an open safety-pin had dropped into its mouth from the mouth of its mother. During the

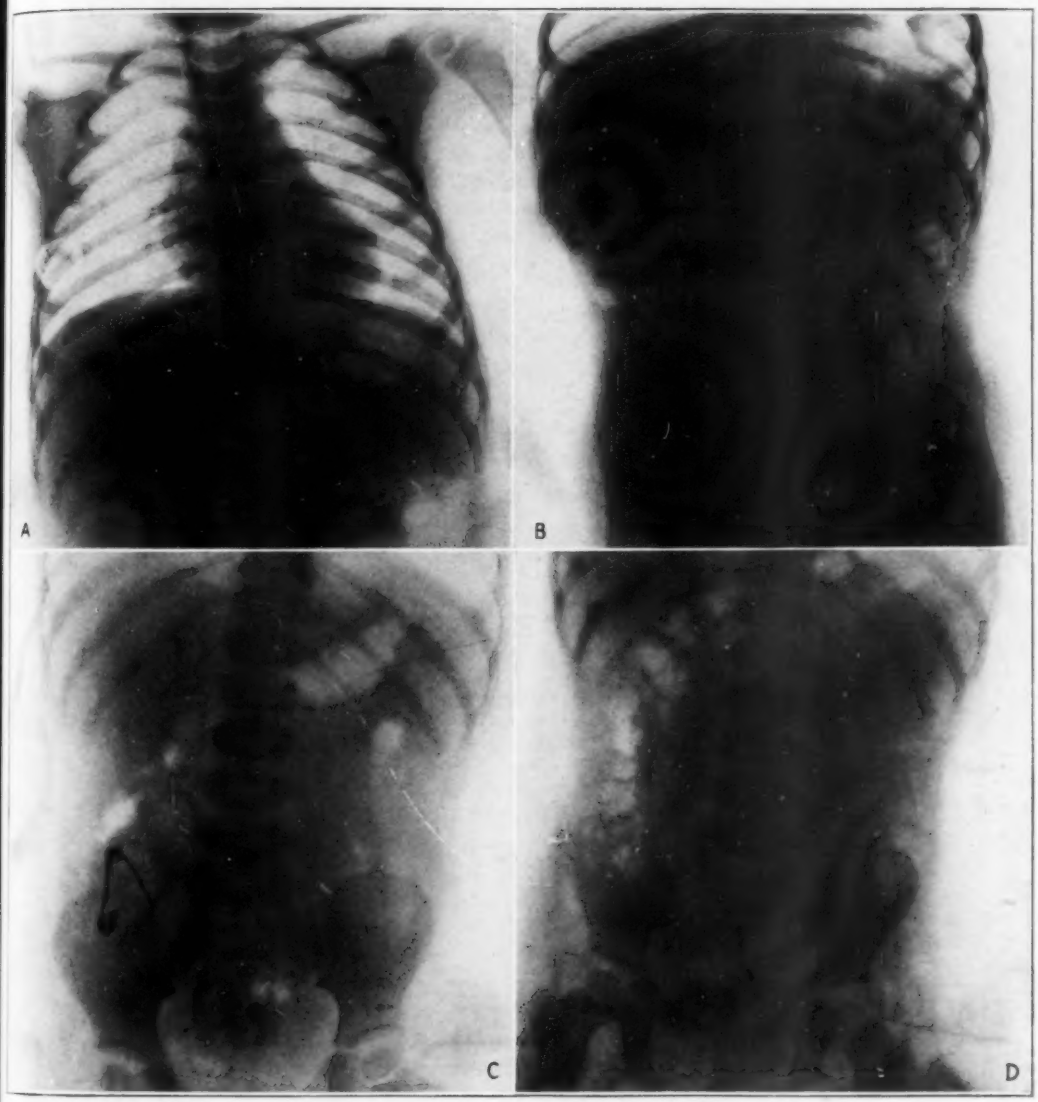

Fig. 2 (N. P.).—*A* shows a safety-pin in the stomach the second day after it has been swallowed. *B*, the pin is apparently still in the stomach two days later. *C*, the open safety-pin is in the cecum on the fifth day after it has been swallowed. *D*, the open pin is in the rectum on the sixth day; it passed the next day.

second day the pin was in the stomach, it was noticed that the infant was in distress. Gastrotomy was thereupon performed, and the pin extracted. The infant made a complete recovery.

In both of these cases, the infants had a severe reaction following operation.

CASE 38.—A girl, aged 6 weeks, was seen at a hospital in Brooklyn. She had swallowed an open safety-pin which was now at the lower end of the esophagus. I performed esophagoscopy, and at the end of nine and one-half minutes pushed the pin into the stomach. Despite my insistence that gastrotomy should not be performed, the infant was subjected to operation a few hours after esophagoscopy. The pin was removed, but the infant died three days later. She did not seem to react after the operation.

Fig. 3 (E. B.).—Closed safety-pin which passed on the fourth day.

CASE 39.—A boy, aged 9 months, had swallowed an open safety-pin. Esophagoscopy was performed by the local endoscopist, but the pin was not recovered. Gastrotomy was performed a few hours later because of the results of the roentgen-ray examination after esophagoscopy. The operation did not disclose the presence of the pin in the stomach. The infant was very ill for a long time after the operation. In fact, the illness was so grave that the safety pin was forgotten. At the end of two months, the safety-pin could be demonstrated in the larger bowel. A roentgenogram taken a few weeks later showed that the pin was no longer present.

CASE 5.—A child, aged 2 years, swallowed an open safety-pin which was pushed down into the stomach. Preparation was made for gastrotomy on the second day, but the insistence of the attending physician that an x-ray picture be made before operation proved that the safety-pin was in the cecum. The pin passed through in seven days.

CASE 36.—A boy, aged 10 years, was referred because he had swallowed two twenty-five cent pieces six days before and they had lodged in his stomach. The family and the physician were concerned over the fact that the coins had been in

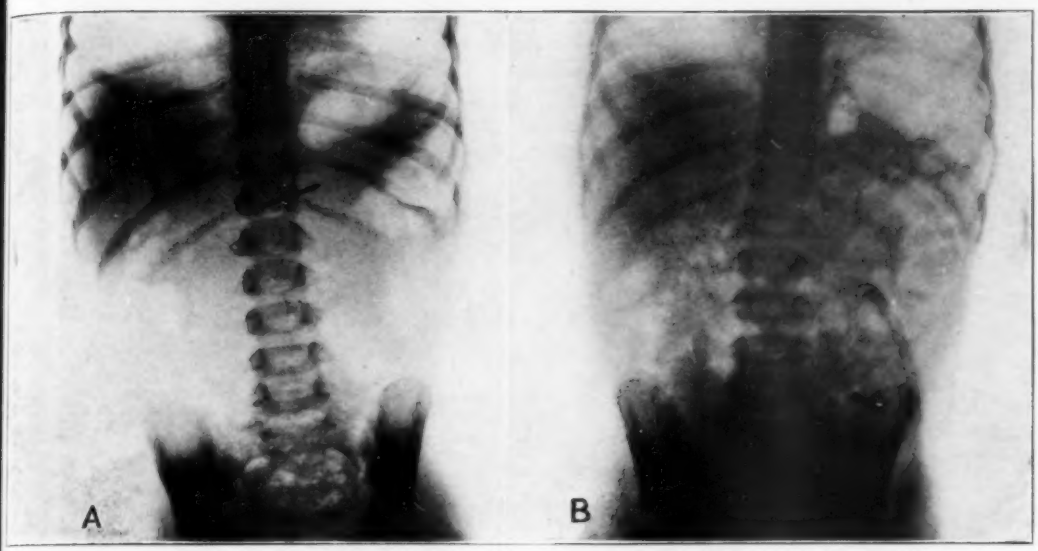

Fig. 4 (E. N.).—*A*, nail, 2½ inches in length, passing through the bowel tract of a boy, aged 4; the nail passed the sixth day after it had been swallowed. *B*, the nail in the sigmoid region four days later; it passed on the sixth day.

Fig. 5 (B. J.).—A straight pin passing through the bowel tract of a girl, aged 20; it passed on the seventh day.

TABLE 3.—*Thirty-Nine Cases of Foreign Body in the Stomach and Intestines*

Case	Sex	Age	Foreign Body	Time Before Object Passed	Remarks
1. B. T.	M	7 months	Open safety-pin	4 days	
2. J. T.	F	10½ years	Paper clip	36 hours	
3. R. S.	F	20 months	Open safety-pin	2 days	
4. E. L.	F	7 years	Straight pin	2 days	
5. I. C. M.	M	1½ years	Closed safety-pin	3	
6. J. S.	M	4 years	Nail	Not noted	Last roentgenogram taken too late
7. E. H.	F	7½ years	Straight pin	3 days	Stuck in throat first
8. J. K.	M	5 years	Paper clip	4 days	
9. A. L.	M	6½ years	Campaign button with pin	2 days	
10. E. B.	F	16 months	Closed safety-pin	4 days	
11. J. B.	M	7 years	Tack	2 days	
12. M. M.	F	19 years	Straight pin	3 days	
13. R. M.	F	2½ years	Tack	4 days	
14. E. N.	M	4 years	Nail	6 days	
15. B. J.	F	20 years	Straight pin	7 days	
16. A. E.	F	7 years	Shawl pin	2 days	
17. L. E.	F	9 years	Tack	4 days	
18. A. D.	M	4 years	Penny	5th day	No x-ray evidence
19. B. F.	F	3 years	Campaign button with pin	.....	Not seen with x-ray on 4th day; expectorated blood immediately after swallowing
20. W. M.	M	3 years	Iron staple	.....	Time not known; watched with x-ray; then missed
21. K. K.	M	15 months	Open safety-pin	.....	Operation performed; pin not in stomach; passed 5th day
22. J. K.	M	4 months	Open safety-pin	.....	Distress on 2d day; gastrotomy; pin removed; recovery
23. M. K.	F	3½ years	Shawl pin	5 days	
24. M. S.	M	7 years	Straight pin	3 days	
25. G. S.	F	9 months	Necktie pin	1 day	
26. A. T.	M	3½ years	Tack	2 days	
27. G. P.	F	13 years	Nail	4 days	
28. A. R.	F	8 years	Red Cross button with pin	2 days	
29. E. S.	F	9 months	Open safety-pin	.....	Removed by gastrotomy, recovery
30. D. K.	M	10 months	Shawl pin	Not noted	Delayed in stomach
31. J. W.	M	14 years	Straight pin	36 hours	
32. B. W.	M	6 months	Penny	2 days	
33. N. P.	M	2 years	Open safety-pin	7 days	Prepared for gastrotomy; operation avoided by timely x-ray
34. A. R.	M	10 months	Open safety-pin	3 days	
35. M. D.	M	7 years	Nail	2 days	
36. J. L.	M	10 years	Two 25 cent pieces	.....	Delayed in stomach 6 days, then passed in 24 hours
37. R. C.	M	11 years	Shawl pin	2 days	
38. F. M.	F	6 weeks	Open safety-pin	.....	Gastrotomy; died 3 days postoperative
39. W. J.	M	9 months	Open safety-pin	.....	Gastrotomy; pin not found; passed 2 months later

TABLE 4.—*Details of Nine Cases in Which Open Safety-Pins Were Swallowed*

Case	Sex	Age	Remarks
1. B. T.	M	7 months	Passed in 4 days; no symptoms
3. R. S.	F	20 months	Passed in 2 days; no symptoms
21. K. K.	M	15 months	Gastrotomy performed; pin not found in stomach; passed in 5 days
22. J. K.	M	4 months	Distress on second day; gastrotomy; removal; recovery
29. E. S.	F	9 months	Large pin; removed by gastrotomy; recovery
33. N. P.	M	2 years	Prepared for gastrotomy; not performed; passed seventh day
34. A. R.	M	10 months	Passed in 3 days
38. F. M.	F	6 weeks	Gastrotomy; died 3 days later
39. W. J.	M	9 months	Gastrotomy; not found; passed 2 months later

Ages ranged from 6 weeks to 2 years. Males, 3; females, 3. Gastrotomies, 5; deaths, 1. Operation unsuccessful in 2 cases.

the stomach so long and had not moved on. It was advised that it would be safe to wait. Within twenty-four hours, the coins had passed through the bowel tract.

The value of such substances as cornmeal, thick cereals, mashed potatoes, bran and similar foods for encasing the pointed foreign bodies is questionable. The prevailing belief that a cathartic is harmful in the presence of a pointed foreign body is also open to question when one considers that twenty-two of the thirty-nine patients received a cathartic and did not suffer any ill effect. It would be well, however, to consider that a cathartic may not be harmless in such cases.

In conclusion, it is important that those who come in contact with cases in which foreign bodies have been swallowed should be acquainted with the various phases of the subject. No surgeon would care to operate on the stomach of an infant unnecessarily, yet many infants' stomachs are opened because of the desire of the family and sometimes also of the physician, for quick and visible results. It is well known to those who have seen infants operated on, that babies under 1 year of age do not stand gastrotomy well.

It would be better to operate after a more positive indication than the mere presence of a foreign body in the stomach for a short time. Gastrotomy would be indicated, first, when there are signs of perforation, and, second, when a large body will not pass the pyloris and the procedure of gastroscopy has been resorted to or found inadvisable. Gastroscopy for the removal of foreign bodies from the stomach has been performed by Jackson [16] and others.

All patients who have swallowed foreign bodies which are sharp or foreign bodies the passage of which appears to be delayed should be kept under observation until the object has been evacuated or until its absence from the bowel tract has been demonstrated. Of course, the prevention of the ingestion of foreign bodies should be one's endeavor.

30 East Fortieth Street.

16. Jackson (footnote 2, first reference).

CICATRICIAL STENOSIS OF THE LARYNX

A PROPOSED METHOD OF TREATMENT WITH REPORT OF THREE CASES *

M. F. ARBUCKLE, M.D.
ST. LOUIS

Cicatricial stenosis of the larynx is looked on as one of the most difficult and unsatisfactory conditions with which the laryngologist must deal. As the cause has an important bearing on the extent of tissue necrosis and, therefore, on the amount of scar formation, a brief discussion of the etiologic factors will be proper at this time.

Infection is, of course, the direct cause of death of the tissues, but trauma plays a most important part in keeping up infection and in causing it to spread. The location of scar tissue within the larynx depends, in a large measure, on the cause, and often has an important bearing on the treatment.

Diphtheric infection is distinctly a necrotic process and may cause sloughing of the laryngeal cartilages. This tendency probably is augmented by additional mixed infection, i.e., infection with streptococci and staphylococci. These organisms also may cause similar lesions, in the absence of diphtheria bacilli. The organisms of typhoid, syphilis, scarlatina, tuberculosis and other diseases also may cause a slough of the laryngeal tissues, with subsequent scar formation.

Trauma, when applied to tissues already highly inflamed, increases the reaction and the spread of infection. I think it is highly probable that trauma plays a most important etiologic part in the majority of cases in which destruction of the cartilage occurs.

The act of respiration within itself is productive of considerable trauma in a larynx which is acutely inflamed and partially closed by swelling. The most serious trauma in such cases, however, with injury to the deeper tissues, probably is produced by the intubation tube. This injury may occur either at the time, or, more likely, at the times, when intubation is done, or it may result from pressure exerted by an ill fitting tube which is worn over an extended period.

Lynah [1] described some of the injuries which may occur when intubation is being done; he included in his paper photographs showing that the tube had been forced into the tissues outside the larynx.

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* From the Department of Otolaryngology, Washington University School of Medicine.

* Read before the Section on Laryngology, Otology and Rhinology at the Seventy-Ninth Annual Session of the American Medical Association, Minneapolis, June 13, 1928.

1. Lynah, H. L.: The Treatment of Stenosis of the Larynx and Trachea following Diphtheria, Laryngoscope **28**:629 (Sept.) 1918.

Sir St. Clair Thomson,[2] quoting statistics by Rogers,[3] stated that about 1 per cent of patients intubated for laryngeal diphtheria are subsequently unable to breathe without an intubation or tracheotomy tube, generally as a result of subglottic laryngitis.

In the cases herewith reported, it was of interest to me to note that the scar tissue was chiefly in the left half of the larynx, and investigation disclosed that each child had been repeatedly intubated by a right-handed man until tracheotomy became imperative.

Some of the other causes of tissue destruction and scar formation within the larynx are foreign body within the larynx, injury by fracture as a result of falls or blows on the neck, and acts of violence, such as injury from gunshot and throat cutting. Tracheotomy is followed by stenosis with all too great frequency.[4]

It would seem proper again to call attention to and to lay emphasis on Dr. Jackson's [5] earnest plea for early, low tracheotomy in cases such as these.

It is not easy to perform a satisfactory tracheotomy on a dying patient, and there is great likelihood that the comparatively large percentage of cases of laryngotracheal stenosis following tracheotomy would be reduced if the operation were performed at a time and under conditions when the surgeon might make a single vertical incision in the midline of the second, third and fourth rings of the trachea. Many physicians dread tracheotomy and put it off until it becomes a matter of last resort because of the mortality rate following the operation.

"The mortality in tracheotomy must be distinguished from that of the lack of promptness in performing it and especially from that due to insufficient after care," according to Jackson.[6] When Dr. Jackson wrote this, his percentage of mortality from all causes within the first week after operation was 1.27 per cent.

If necrosis is limited to the mucosa, scar formation will follow, but the general contour of the larynx probably will remain unchanged. When the cartilages of the larynx slough out partially or completely, collapse takes place where the loss occurs, and this deformity becomes greater as scar contraction increases.

It is, of course, true that the more superficial lesions may have webs or bands of scar tissue stretched across the laryngeal lumen at

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2. Thomson, Sir St. Clair: Diseases of the Nose and Throat, ed. 3, New York, D. Appleton & Company, 1926, pp. 616-617.

3. Rogers, J.: Am. J. M. Sc., 1905, p. 793.

4. Sewall, E. C.: Ann. Otol. Rhin. & Laryng. **31**:352 (June) 1922.

5. Jackson, C.: Peroral Endoscopy and Laryngeal Surgery, St. Louis, Laryngoscope Company, 1914.

6. Jackson (footnote 5, p. 587).

any level from the false cords to the cricoid, or the hypertrophic type of stenosis may be found, but these types are not so serious as those in which cartilage has been destroyed.

In the less serious cases, satisfactory results can be obtained practically always with treatment by endoscopic methods, as fully described by Jackson [5] in his book "Peroral Endoscopy and Laryngeal Surgery." In the serious cases, in which there is deformity of the laryngeal cartilages, laryngostomy,[5] also developed and described by the same author,

Fig. 1.—Normal larynx.

will probably be required. Dr. Jackson, in his chapter on laryngostomy, published in 1914, called attention to the fact that skin lined cavities lose their tendency to contract.

Major Gillies, R. A. M. C.,[7] learned during the war, and taught me, that a reconstructed nose will not contract, if properly lined with skin, whereas it will be spoiled entirely by contraction if it is not thus treated.

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7. Gillies, H. D.: Plastic Surgery of the Face, New York, Oxford University Press, 1920, pp. 8 and 9. (Method of Esser described and modified by Gillies and Waldron.)

Crile [8] reported a case of laryngeal stenosis in which the larynx was opened wide, the scar tissue completely dissected out, and an attempt made to cover the raw area immediately with large and accurately placed skin grafts. The grafts in this case did not grow, and it is my feeling that the failure was probably due to his having neglected to apply pressure to the grafts.

Lenart [9] of Budapest saw a case in which adhesions followed three weeks after the surgical removal of tuberculous granulations. The

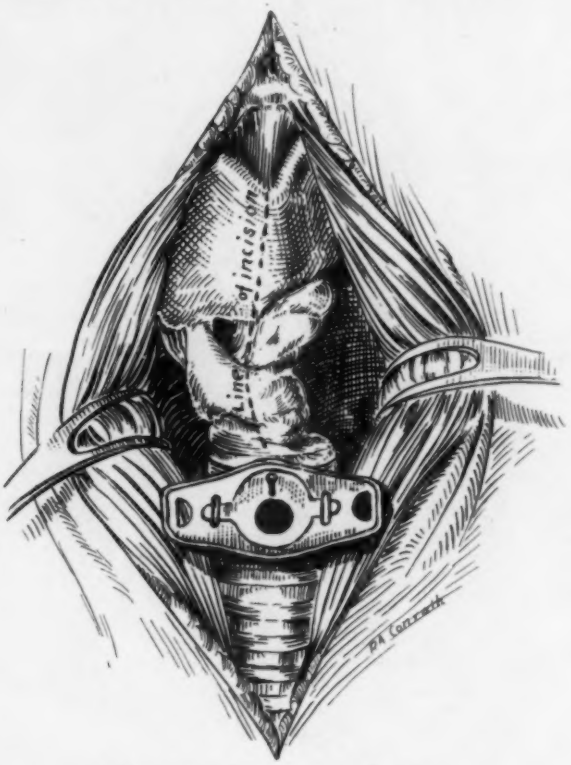

Fig. 2.—Larynx before incision.

patient was treated by laryngofissure, and excision and the application of Thiersch grafts.

In May, 1921, I [10] reported a case in which a Thiersch graft had been applied to the external canal, chiseled surface of the mastoid, mid-

8. Crile, G. W.; Loeb, H. W., et al.: Operative Surgery, for the Nose, Throat and Ear, St. Louis, C. V. Mosby Company, 1917.

9. Lenart, H. J.: Mittelst Laryngofission und Transplantation beheilter Fall von Larynxstenose, Ztschr. f. Ohrenh. **68**:277, 1913.

10. Arbuckle, M. F.: Demonstration of Skin Graft to Middle Ear Eustachian Orifice and Chiseled Surface of Mastoid, J. Missouri M. A. **18**:182 (May) 1921.

dle ear cavity and eustachian orifice in an operation for reestablishment of the external auditory meatus and canal. Ferris Smith used skin grafts to reline the maxillary sinus, and I[11] have used Thiersch grafts to reline the nasofrontal duct which had been closed by disease. It is of the greatest importance that strict attention be paid to certain details in the application of Thiersch graft, if success is to be obtained. The surface to be grafted must be carefully dried of all secretions, including

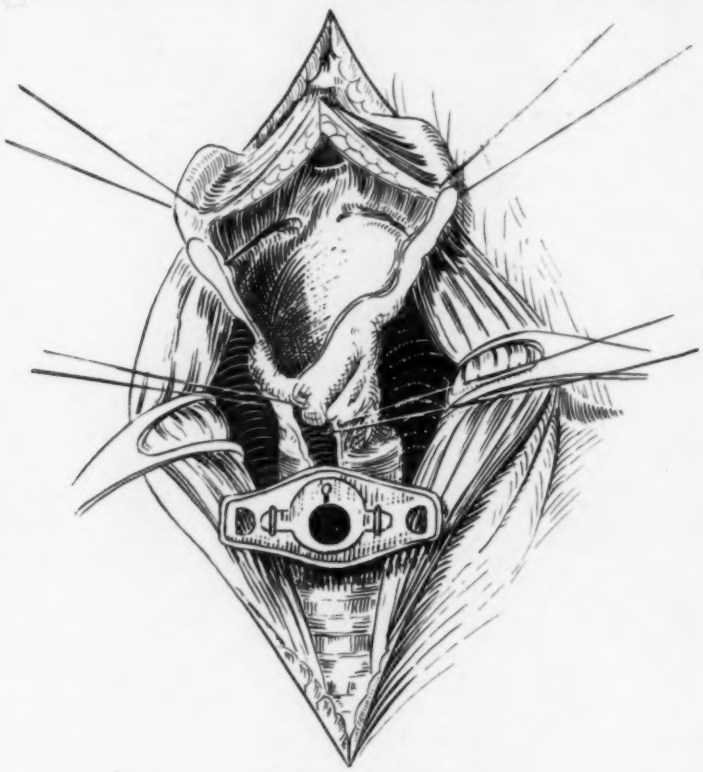

Fig. 3.—Larynx after incision.

blood clots.[12] The graft must be directly applied to the cut surface, and firm, even pressure,[13] by means of a specially prepared obturator, must be continuously maintained for seven or eight days. In laryngeal cases, the obturator and graft are almost certain to be dislodged and

11. Arbuckle, M. F.: Diagnosis and Treatment of Inflammatory Disease of the Nasal Accessory Sinuses, South. M. J. **17**:293, 1924.

12. Gillies, H. D.: Plastic Surgery of the Face, New York, Oxford University Press, 1920.

13. Blair, V. P.: The Influence of Mechanical Pressure on Wound Healing, Illinois M. J. **46**:249 (Oct.) 1924. Gillies (footnote 12).

coughed up if not firmly anchored. This is accomplished by a through and through stay suture tied on the outside. This suture must, of course, be placed before closure of the larynx is begun. The most satisfactory obturator, is made from sea sponge,[14] cut to fit snugly within the cavity to be relined. Infection [12] apparently does not prevent the graft from taking.

Sir St. Clair Thomson,[15] in his chapter on the treatment of stenosis of the larynx, which contains an extensive bibliography on the subject,

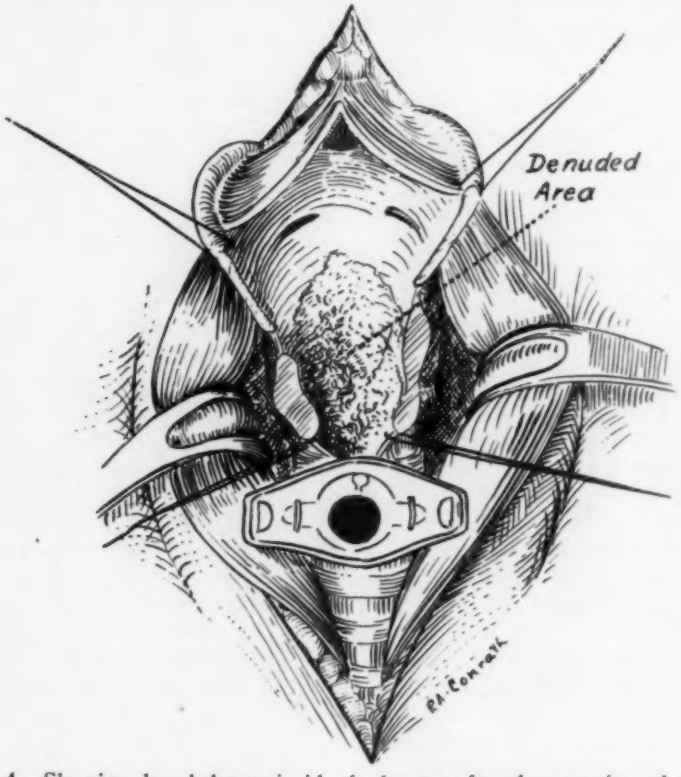

Fig. 4.—Showing denuded area inside the larynx after the scar tissue had been dissected out and the wall replaced in its normal position.

quoted Samuel Iglauer [16] of Cincinnati, who recommended the use of rubber tubing, placed within the larynx, and worn over a long period in order to cause resorption of the cicatricial tissue. O'Dwyer,[17] in

14. Davis, J. S.: Use of Sea Sponge as Surgical Dressing, Arch. Surg. **11**:946 (Dec.) 1925.

15. Thomson (footnote 2, pp. 619-620).

16. Iglauer, Samuel: Tr. Am. Laryng. A. **40**:329, 1918.

17. O'Dwyer: A New Method of Treating Chronic Stenosis of the Larynx, M. Rec. **29**:641 (June 5) 1886.

1886, reported one case in which the patient had been treated by means of a special tube placed within the larynx and worn over an extended period, causing resorption of scar tissue by pressure. In such cases, however, the deformity of the voice box is apparently not extensive, as is shown by Iglauer's illustrations.[18]

In all forms of treatment employed in these cases to date, including laryngostomy, a long period, months or years, is required for the epithelium to grow over denuded areas and for the scar tissues to be

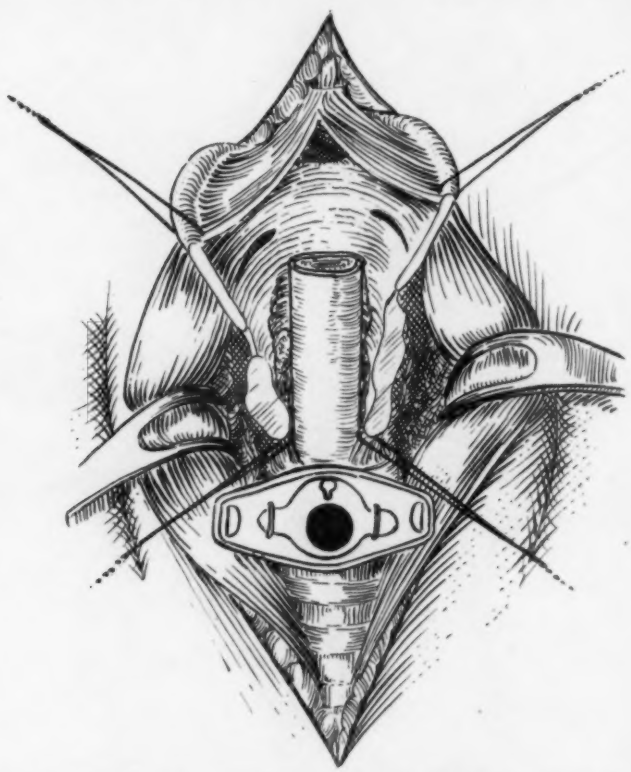

Fig. 5.—Showing the sea sponge in position with the Thiersch graft surrounding it on all sides over which the cut edges are to be drawn together in midline holding the sponge and skin graft in tight apposition to the denuded area. The figures are diagrammatic, resembling closely the observations in case 2. They are fairly typical of the observations in all three cases.

absorbed. While treating the patient in the first of the cases herein reported, it occurred to me that the distorted laryngeal walls possibly might be straightened out and replaced in their normal positions, and the lost epithelium supplied immediately by the application of Thiersch

18. Thomson (footnote 2, p. 620).

grafts. One, of course, realizes that it is impossible to arrive at any definite conclusions regarding the value of any type of treatment as a result of such meager experience. Since the results obtained in these cases apparently are so satisfactory, they are reported here in the hope that with further refinement and greater experience it may be possible to improve the methods of dealing with cases such as these. If similar results can be obtained in other cases, the period of disability and convalescence can be shortened greatly, and I think it will be possible to obtain better anatomic and functional results than by laryngostomy; and last, but not least, the laryngologist and his staff will be saved a great deal of hard work.

REPORT OF CASES

CASE 1.—*History.*—M. M., a white girl, aged 6 years, admitted to the St. Louis Hospital on Sept. 17, 1923, had been admitted to the St. Louis City Hospital on June 21, 1923, with laryngeal diphtheria. She was intubated at that time. The tube was removed and replaced every second or third day until July 15, when an emergency tracheotomy was done because of the inability to reintubate the patient. This was a high tracheotomy. The tracheotomy tube was removed and cleansed daily but was replaced with increasing difficulty.

Cultures from the intubation tube were positive for Klebs-Löffler bacilli, but those from the throat were negative. This was also true when I first saw the patient in September.

Examination, Treatment and Course.—The larynx was normal down to the level just below the vocal cords. At this level, the lumen was apparently completely occluded by a web of firm scar tissue. This web was incised, and a dilator was passed through the opening. At a later sitting, a bronchoscope was passed through this opening, and a dense scar was encountered just above the tracheal tube.

It was possible to pass this scar with a no. 17 Jackson bougie. Breathing was not improved by this method of treatment, and after each sitting there was considerable bleeding, cyanosis and shock. These untoward symptoms caused me to abandon endoscopic measures and try other means.

Further delay was caused because the patient went to her home until January, 1924. Laryngostomy was then decided on, and on Feb. 2, 1924, under gas anesthesia, an incision for this operation was made.

The left wall of the larynx in the lower part of the thyroid cartilage, down to and including the cricoid cartilage and the first ring of the trachea, was found to be distorted and irregular in shape, as a result of having collapsed in the direction of the opposite side, toward which they had been drawn by cicatricial contraction. The lumen at the level of the cricoid was occupied by a mass of scar tissue. In dissecting up the scar tissue, considerable bleeding occurred, and the party wall was acidentally cut through. It was thought necessary to abandon the operation and to pack in order to stop bleeding. A fistula resulted, and gastrostomy was necessary to carry on nourishment.

On May 1, 1924, the larynx and trachea were again exposed through incision on the median line. The external appearance of the larynx was the same as at the first operation. It was possible, by careful dissection, to reform the left wall out of the scar tissue, and replace it in its normal position. This left a considerable denuded area within the lumen.

A Thiersch graft was mounted on a tiny cigarette-shaped balloon, to either end of which a stout thread was attached. The thread was grasped from above, and the balloon and graft pulled into position; the balloon was then inflated so as to fit snugly within the lumen. It was anchored by the lower thread to the tracheotomy tube, and the upper thread was cut off at the larynx. The incision was closed by layers.

On the eighth postoperative day, the tracheal tube was removed, and the balloon was punctured and withdrawn. By retrograde inspection, I observed that the graft had taken, and that the lumen remained patent.

A 4 mm. bronchoscope was passed through the lumen with ease one month after operation and at later intervals.

The tracheo-esophageal fistula persisted, in spite of attempts to close it, and the tracheotomy tube was not removed permanently, because I felt that it might be needed when further attempts to close the fistula were carried out.

The patient could speak in faint tones when the tube was temporarily removed or when it was occluded. The anesthetists who helped with this operation contracted diphtheria. The cultures from the tube became negative soon after the operation.

The patient died in August, 1924, about one week after an attempt by plastic operation to close the laryngotracheal fistula.

The autopsy report gave the cause of death as peritonitis due to perforating gastric ulcer.

CASE 2.—*History.*—O. F., a white boy, aged 4 years, was admitted to the St. Louis Children's Hospital on July 6, 1924, with the diagnosis of postdiphtheretic laryngeal stenosis. He had been treated elsewhere for diphtheria four months previously, during the course of which treatment he had been intubated thirty times within seven days. On the seventh day, after having been intubated seven times, an emergency tracheotomy was performed.

Cultures from the throat soon became negative, but from the tracheal tube they remained positive for Klebs-Löffler bacilli.

Treatment and Course.—On July 11, a no. 16 Jackson dilator was pushed through the larynx with great difficulty, causing bleeding from the tracheotomy wound. Dilation was attempted during the following month at weekly intervals, but with increasing difficulty, because of the resistance of the scar tissue. Dilatation was followed each time by immediate closure, and it was decided on October 6, that all efforts at reestablishing the lumen by endoscopic methods would be futile, and that an external operation was indicated.

On November 14, under ether anesthesia, a midline incision was made down to the larynx, and the larynx was opened in the midline. A small piece of cartilage imbedded in scar tissue, about 0.5 by 1 cm. was found occluding the lumen of the larynx. This was dissected loose from its point of adhesion, and the left wall was replaced in its normal position. A small piece of granulation tissue on the posterior wall was excised. A rubber balloon covered with Thiersch graft was then placed within the lumen and inflated, and the wound was closed by layers. The balloon was removed one week later, and examination showed that the skin graft had taken. The cultures from the tracheotomy tube soon became negative for Klebs-Löffler bacilli.

Laryngeal dilators were passed at intervals of from one to two weeks through January and February, the various sizes up to no. 26 being used. About March 1, 1925, the child was talking, though the voice was somewhat hoarse. On April 15, a 5 mm. bronchoscope was passed. The lumen was observed to be normal at

this time, and the tracheotomy tube was removed. Although the breathing was not obstructed the child fretted and cried to have the tube replaced, and about one and one-half hours later he became panicky and so cyanotic that the tube had to be reinserted hurriedly. Two weeks later, the tube was again removed, but this time by a nurse of whom he was fond. The physician was present, but not visible to the child. In order to avoid frightening him by the absence of the tube, the collar of the tube was removed and again tied about his neck. He was happy and contented and did not have any difficulty in breathing, indicating that the previous attack of cyanosis and dyspnea was due to panic.[3] He continued to wear the collar for about seven days. He was discharged from the hospital on June 10, 1925, in good condition and breathing normally.

On July 14, the patient returned for inspection, and a 5 mm. bronchoscope was passed without difficulty. He was seen every six months up to May, 1928. On this date, the only remaining trace of laryngeal disease was a small fistula at the site of the tracheotomy wound which had been purposely left open; this will now be closed. He has a husky but serviceable voice, and he can run and play vigorously with the other children.

CASE 3.—*History.*—K. F., a white boy, aged 3 years, was admitted to the St. Louis Children's Hospital on Jan. 14, 1926, with a diagnosis of laryngeal stenosis, due to streptococcic laryngitis which had occurred at the age of 17 months. He had been intubated and reintubated with great difficulty at the time of the initial attack, and an emergency tracheotomy finally was done. Physicians had been unable to remove the tracheotomy tube.

Examination, Treatment and Course.—Laryngeal examination on admission showed a supraglottic hypertrophy which prevented examination of the region below the cords. Attempts at endoscopic dilation were unsuccessful.

On March 30, under ether anesthesia, a midline incision in the neck was made, exposing the larynx. At the level of the cricoid, the lumen was found to be reduced to the size of a pinhead, as a result of cicatricial contraction following loss of tissue and subsequent contractions. The lateral wall of the lower part of the thyroid cartilage on the left had been carried in by contraction and was adherent to the posterior wall of the larynx. The adhesions were loosened, and the scar tissue which remained on the walls was dissected out, thus restoring the normal size of the lumen. Considerable hypertrophic tissue was removed from the interarytenoid space. A Thiersch graft was mounted on a piece of sea sponge, cut to fit the lumen, and placed in position to cover the denuded area. The sponge was covered with a single layer of gauze and a single layer of rubber tissue. At this operation, I failed to anchor the obturator, with the result that it was coughed up a few hours later. Six weeks later, on May 10, the operation was repeated, and the sponge with the graft was anchored by a silkworm through-and-through suture. On the eighth day, the stay suture was cut, and the obturator was withdrawn through the tracheotomy wound. The graft was observed to have taken, and the lumen remained patent.

On May 31, a 4 mm. bronchoscope was passed without difficulty into the trachea, and the skin graft was seen covering the area which had been denuded at operation. The supraglottic hypertrophy was treated by endoscopic means, electric cautery, punch forceps, dilators, etc., until July 11, when the patient returned to his home in Indianapolis. Further treatment of this lesion has been carried on at intervals by Dr. Carl McCasky, of that city, who wrote me on June 5, 1928, "The operative procedure has been very successful," etc.

CONCLUSION

The tracheotomies in the three cases were all so-called high tracheotomies. In the two cases in which the patients are living it is my feeling that sufficient time has elapsed to justify the belief that relief is permanent.

ABSTRACT OF DISCUSSION

Dr. Helen Gage, St. Louis: The criterion by which the value of any therapeutic measure should be judged is the ultimate result obtained as to restoration of function. Other factors which should be taken into consideration are the length of time required to obtain satisfactory results, i. e., the length of time the patient may be inconvenienced or disabled, and the amount of discomfort caused by the treatment. Cicatricial laryngeal stenosis may usually be treated successfully by endoscopic measures. All are familiar with the length of time required to obtain satisfactory results by this method of treatment, and with the degree of inconvenience and discomfort occasioned the patient.

It was my privilege to see one of the cases reported by the author in which open operation and skin grafting had been done after endoscopic measures had failed. Nearly three years have passed since the operation was performed. The boy is about 7 years of age and is in school, working and playing normally. His voice is slightly husky, but he speaks easily, and function has been entirely restored as to respiration. The skin graft may be seen by indirect examination. The series of cases reported by the author is small, but the satisfactory results obtained would seem to suggest that this method may be useful in treating patients with cicatricial laryngeal stenosis not only because of the satisfactory results obtained as to function, but also as a means of shortening the period of disability incident to a long series of endoscopic treatment, and of lessening the amount of discomfort to the patient.

Dr. Samuel Iglauer, Cincinnati: A greater problem does not exist than that of the treatment of a child who has chronic laryngeal stenosis. Dr. Arbuckle mentioned some of the factors which lead to this stenosis. I agree with him that many of the cases are due not only to the diphtheritic process itself, but to the faulty introduction of the intubation tube. I do not believe that structural changes in the cartilage occur frequently; I think the stenosis is usually caused by scar tissue, and it is usually subglottic, just below the cricoid ring. In order to treat the patients, dilatation must be done, or some methods such as Dr. Arbuckle has described must be used. I have found that they cannot be treated except by the man in charge. If an intern is allowed to treat the case, the results are unsatisfactory, so I usually have the patients made ambulatory as soon as possible and brought to the office where I can treat them myself. I believe that relief may be obtained in a great many of the cases by constant dilatation with a rubber tube such as was shown on the screen. Dr. Sewall has modified my procedure by bringing the catheter out through the nose. The catheter rests in the larynx and the nasopharynx, and the tip comes out through the nose. I believe patients are more comfortable with the catheter in that position. The catheter is left in place for one week and is then taken out and cleansed. The trouble with stricture of the larynx is that it presents rigid walls. It is not like stricture of the esophagus in which you can dilate the whole tube. I believe the method Dr. Arbuckle suggested will improve the results in these cases. With some such procedure, the tracheotomy tube should eventually be done away with, and one should not worry about the voice. The method of anchoring described by

Dr. Arbuckle is similar to that of Schmiegelow, who introduces a rubber tube into the larynx, sutures the tube in place and leaves it there for weeks at a time. He reported that he had cured many patients. Attempts have been made, I believe, to transplant grafts of mucous membrane as a lining for the air passages, but they do not hold well. I think with the use of the Tiersch graft it will be possible to report cures.

DR. M. F. ARBUCKLE: I have not been able to make up my mind as to what cases are suitable for this type of operation and which patients should be treated by the endoscopic method, except that in those cases in which I did not get results with endoscopic measures I did get results by this method. Lest I be misunderstood, I want to say that I feel that criticism should not attach to the man to whom accident befalls when he is doing an emergency intubation or tracheotomy because I have done both and have had things happen which I do not believe could have been avoided. I do not know of Dr. Schmiegelow's work, but I am glad Dr. Iglauer called my attention to it. I have seen complications occur in the ears in patients who had tubes in the nose for feeding purposes, or packs of any sort, and the thought occurs to me that this might happen in these cases. The improvement in the voice increases and continues over a long period, as all know.

I do not read French or German, and for that reason I was not able to include a complete bibliography of publications in those languages. However, this bibliography will be found in St. Clair Thomson's new book on diseases of the nose and throat and in Dr. Chevalier Jackson's works on endolaryngeal surgery.

DENTAL CARIES IN PARANASAL SINUS INFECTIONS *

GORDON BERRY, M.D.
WORCESTER, MASS.

Able and careful authorities have taught that 20 per cent of maxillary sinus infections are of dental origin. Since then the x-ray apparatus has been perfected; the war occurred, in which medical units were established, with team work between dentist, oral surgeon, roentgenologist and rhinologist; modern medicine has entered on what might be termed a prophylactic era, and among other efforts there has been a concerted drive against so-called infected foci; the internist, the obstetrician, the urologist and the surgeon have joined in the hue and cry against the innocent grinders. I, too, have partaken of this mob psychology, for I am proposing to the members of the American Laryngological Association that 60, and perhaps 80, per cent, rather than 20 per cent, would be a more accurate estimate of the dental complications in maxillary sinus infections.

I have been impressed with the frequency of dead or abscessed teeth in patients with paranasal sinus infections, and I have had it rather forcefully demonstrated that a dentist can step in and remove a tooth for other reasons, and my patient proceed to get well. A study of the relation of the teeth to the maxillary sinuses both in the anatomic specimen and in the x-ray film, and a review of my routine private records back to the arbitrary date of Jan. 1, 1926, in an attempt to find all the cases in which the diagnosis was some form of sinus trouble, are the basis of this report. Many authors can show a more impressive series than the 152 cases thus found, but I hope these will give tentative conclusions which will serve as a basis for argument and stimulate further investigation.

ANATOMY AND PATHOLOGY

Through Dr. Mosher's courtesy, I have had access to the anatomic specimens in the Harvard laboratories. First, one notices that there are two main classifications in specimens from the maxillary sinus; those with small cavities and thick floors, and those with large cavities and thin floors, the latter group being much the greater. In the specimens in which the teeth are present, one finds their roots at some distance from the cavity in the small antrum type, while the dental roots mound up into or straddle the floor in the large antrum type. When the teeth

* Read before the American Laryngological Association, Washington, D. C., May 3, 1928.

have been lost sufficiently long before death, the alveolar process is atrophied, and the bony floor of the antrum may be as thin as one sixteenth of an inch (0.11 cm.). In some specimens, a small tooth root remains which shows immediately beneath the antral floor. In the large type maxillary sinus, two general shapes are discovered: the triangular, and the square or quadrilateral. The triangular usually dips its lowest in the second and third molar regions, while the square type, with its partitions, has a fairly horizontal floor which extends forward to near the root of the first bicuspid and at times to the cuspid. Any dental x-ray film which is taken high enough to show the floor of the antrum will demonstrate this relationship. Another interesting point is the arrangement of the roots of these particular teeth. The canine or cuspid shows one root, extending high. The first bicuspid usually has two roots, somewhat spread, while the second bicuspid usually shows but one. The third molar's roots are also frequently united, while the first and second molars show three spreading roots which straddle the floor in the large type of antrum, two roots being on the buccal side and one on the palatal side. X-ray films of such roots will show differing relations to this antral floor, depending on the angle of taking. The usual film shows the palatal root reaching high beyond the antral floor and the two foreshortened buccal roots appear below in what might be called the foreground. One other observation in these relationships is relevant. In a typical film of a dental abscess, the infection has progressed through the dental canal and seeping out through its apex has gradually eaten away sufficient bony tissue to show this rarefaction in the film. If one fails to find such a budding or saccular dark area in the film, a negative report may be made. In the region I am considering, however, if the root reaches nearly to the antrum, by its very nature there is little or no bony absorption before the infection reaches the antrum itself. With the establishment of a bony fistula into the antrum, there is little or no more bony destruction, and the film of this region does not show the typical abscess formation the reader of the film is seeking. One is told that the dental observations are negative; that chapter in the investigations seems closed. It is my observation that this is the type of case which has been missed, and I am submitting for consideration the crux of my whole argument: that a dead tooth which in the film is seen to reach or extend near to the floor of an antrum is an active menace which must be carefully watched and seriously considered. The trouble will often not be apparent in the dental film. This infection may be escaping, slowly but surely, into the antrum, and thence, if the ostium is free, into the middle meatus of the nose, or by an accessory ostium behind the middle turbinate into the posterior nares. Such infection may apparently

do no more harm than a dental cavity that is feeding its infection into the mouth. But it is my conviction that one may look to this source for a considerable portion of those nasal difficulties which have been recorded under such inclusive terms as chronic rhinitis, nasal polypi, chronic anterior ethmoiditis and some vasomotor forms. The rhinologist thus becomes better able than the dentist to determine whether this suspected tooth is doing harm. This general position impresses me as having both a logical and an anatomic basis. A reference to a general experience in operations on the tonsils will argue as to its logic. Not infrequently after tonsillectomy a patient will remark that his breathing is freer, though nothing was done to his nose or nasopharynx; a recurring otorrhea of long standing, which will not yield to local treatment, can sometimes be cured simply by the removal of infected tonsils. It is fair to presume that this relief in congestion of the turbinals or eustachian tube was obtained by the removal of the chronic tonsillar infection. If the foregoing anatomic observations are accepted, an infected root of an upper back tooth may be in closer relationship to the nose than were the tonsils. Some of you have perhaps had personal experience with an increasing nasal or antral trouble when a large tooth cavity was filled, and of an improvement in these symptoms when the filling worked loose and fell out. I think of this filling as a plug which directs the dental canal drainage back up through the antrum. The only exit then is through the nose or by the antral lymphatics.

TECHNIC EMPLOYED

The 152 patients were not examined with especial reference to this investigation but received a routine examination such as is probably generally employed, with this possible important exception—that I had secured a transilluminator such as dentists have for lighting up alveolar processes, and was using this as a part of my routine throughout this series. By increasing the current, I have found the same lamp to be the best transilluminator for paranasal sinus shadows. This light rarely fails to find what the roentgen ray of the sinus will later show (it does not, of course, help with the posterior sinuses), and it is surprising how surely and accurately it will pick out the dead or devitalized teeth. I can, with comparative safety, tell the patient which teeth to have examined by the roentgen ray and which are beyond suspicion. When the root reaches the floor of the antrum or when the reading is in doubt and the peridental lamina line is not clear, an electric vitality test gives further evidence. It has been proved in my experience that two tooth roots may be alive and the third one dead, so that the tooth is reported alive and yet the third root may show an abscess on the end at the time of its extraction. But usually such a tooth will show a diminished vitality in the test and indicate a dying condition.

REPORT OF CASES

In order to review this series, the general types of cases encountered may be studied. The first type selected is that of the patient with the common cold.

CASE 1.—F. E. B., a man, aged 66, who lived on his dry, healthy, moderately elevated country estate in northern Connecticut, consulted me last fall because of a chronic pharyngitis. There had not been any pain or trouble in the teeth, and he was in the habit of seeing his dentist regularly. In the course of the examination, I discovered a shadow over each upper second bicuspid. Further examination by several dentists corroborated my suspicion that these two teeth which reached each antral floor were dead and abscessed. The patient had them removed. A few weeks ago he came to the office to tell me that circumstances had caused him to spend the winter in Boston where he supposed that the damp raw climate would aggravate his usual troublesome winter colds. To his surprise, he went through this experience without any cold, and he felt that the removal of these teeth was directly responsible. When I told him that I was working up this paper, he arranged to send me the roentgenograms. My conclusion is that the infection from these teeth gradually worked up from the antrums into the nose and furnished the basis for his colds. There may be objections to considering this case one of sinus infection, but it may surely be called the initial stage.

CASE 2.—Mrs. L. B. H., aged 33, the wife of a laryngologist, had been under his observation for a condition such as the one just described. I found an acute exacerbation of a suppurative right antrum, and an abscessed upper right second bicuspid. The tooth was removed. There was no fistula up into the antrum. Because of the frank thick pus with accompanying pain and at the physician's request, I performed irrigations twice through the inferior meatal wall. For over a year, there has not been any trouble, and the patient's husband ascribes this to the removal of the tooth.

The next type is a further advanced condition: chronic colds with recurring acute exacerbations in which the same antrum always becomes involved, and in which there may or may not be an anatomic narrowing of the middle meatus which could impede drainage.

CASE 3.—Mrs. J. E. McK., aged 35, who had had minor rumbling antral pains from time to time, with finally an acute exacerbation brought on during the exposure of a rather long automobile ride, presented a case similar to that of patient 2. Both antrums showed an acute suppurative process. The upper right second bicuspid and upper left first molar, which were not giving any discomfort, were found to be abscessed and were removed. Shrinking nasal sprays provided adequate drainage. The patient returned two years later to tell me that there had not been any recurrence.

CASE 4.—Mrs. M. D., aged 32, presented a condition which proved to be of longer duration. Clinically the antral pains were mild, and they recurred with her colds. Even when she was free from a cold, I could often detect a little congestion, or even a little thin pus, in the right middle meatus after the shrinking back of the tissues. An accompanying sense of prostration much concerned her, as she was an active, busy, healthy mother. The upper right first molar and the

lower right second bicuspid were dark on transillumination. A competent local dentist had treated and completely filled the canals as shown in the x-ray picture. As no abscess was revealed and there was not any pain, the dentist advised against extraction. Finally, as a result of my urging, the upper right first molar was removed. The condition of the nose and antrum cleared up. Later, the tired condition returned accompanied by sciatic rheumatism, following tonsil trouble. A tonsillectomy was done. Her general condition became better, but did not quite clear up. I insisted on the removal of the dead, but apparently negative, lower bicuspid. The rheumatism and tired feeling left, and did not return. In this case there were three different septic foci. The antrum cleared with the extraction of the dead tooth in its floor; the general trouble did not finally clear until the other foci were taken care of.

CASE 5.—Mrs. L. O. McG., also the wife of a physician, presented a condition of eight years' duration, with a history of nasal polypi and increasing sinus pains. A most competent physician, a professor in a leading medical school, performed a bilateral radical ethmoid and sphenoid exenteration by the external route. Six months later he performed a radical operation on the left antrum. She then moved to another medical center where a specialist in such therapy administered vaccines for an asthmatic condition which was becoming increasingly serious. Finally, she went to Italy in search of a better climate, and spent two years in comparative comfort. Returning to this country, she became worse again. She chanced to be residing in Worcester at the time, and her husband asked for some suggestion that might cause improvement in her condition. The asthma was becoming severe, and he was administering epinephrine hydrochloride subcutaneously for her relief. Transillumination and x-rays showed the sinuses all cloudy. The surgical procedures were well carried out, but granulation tissue had formed, as would be expected. I was skeptical about any permanent gain from a secondary operation. Her husband not only gave me this careful history, but added that the teeth had been examined by the x-ray and that he knew they were in good condition. My transilluminator revealed a shadow over the upper right and the upper left first molar areas, the very regions I expected to find trouble in. I insisted on her consulting Dr. Frank Dean. He became convinced that the upper right second bicuspid and first molar, and the upper left second bicuspid but not the molar, were dead and abscessed. We recommended their removal. I did not operate, and I have not seen her since. I have heard, however, from her husband that the teeth were removed and conditions began promptly to mend. A year later she was able to live on the Atlantic seaboard in comfort, and I understand there has not been a recurrence.

CASE 6.—Mrs. B. McC., aged 52, the wife of a physician, had a dark right antrum, and pus was escaping from her right middle meatus. She said that her teeth were all out. I requested her to remove her dental plate, and under it found a small sinus, leading to what proved to be a tooth root remnant of the upper right first molar. Her dentist removed this sequestrum and she was given only a cleansing spray for occasional treatment at home. She returned a month later with the nose free of pus, the congestion about the middle turbinal gone, the gums healing and the antrum shadow much smaller.

The next type of case is the classic one of an acute or chronic alveolar fistula into the antrum, the result of the extraction of a tooth. In some patients, disease of the antrum had not been suspected until the dentist obtained foul pus through the broken antral floor. Some claim that this

infection is superimposed from the mouth, but I have seen these fistulas clear and close without any treatment other than an occasional cleansing by the patient himself, provided the surrounding necrosis is removed or any other suspected tooth pulled. The first operative approach to the antrum was by this route. I am beginning to doubt the dangers from the entrance of infection due to food, and am wondering whether in selected cases, in which the dental origin is fairly certain, this should not be the chosen approach. Detailed reference to this type of case is not necessary for they occur frequently. It may be of value, however, to cite one case (not in this series).

CASE 7.—Miss J. was referred to me by an ophthalmologist for the removal of some nasal polypi. This operation was done two or three times. The polypi recurred. I did not see the patient for several years until she was sent to me by a dentist after he had removed a bad tooth and with it so much of the antral floor that she could almost put her finger up through the opening. I was solicitous at first to keep it clean, but soon noticed that it drained itself. I also discovered that the nasal granulations about the middle turbinal which had kept recurring were shrivelling and disappearing without any help from me. I let her choose between a plastic flap operation to close this alveolar gap, and a postponement to see how things turned out. She elected the waiting policy, and in about six months the wound was bridged across with little help from me. The nose and the antrum have cleared up and do not give any more trouble, because of the tooth extraction which I should have advised but did not.

I will refer to one more general type of cases: those of chronic antrum trouble in which lesser measures fail, in which diseased teeth may be found and be removed without relief, or in which diseased teeth may have been present and have been removed years before the patient is examined. I picture these cases, in the light of my experiences, as cases starting with a dental infection which caused bony necrosis in the floor of the antrum that was not removed with the extracted tooth. I performed two radical operations on the antrum recently with this point in mind. Diseased teeth that could have infected the antral floor had been removed long before I performed these operations. Working from above, I found the polypoid tissue and granulations most abundant in that part of the cavity just above the areas in which the teeth had been removed. In thinking back over radical operations on the antrum, one will recall an excess of granulation tissue attached to the floor in most instances. Cure has been obtained in such cases, perhaps, without the extraction of any teeth. Possibly the teeth had been already extracted; or possibly they continue to give trouble in a little chronic seepage which drains right out because of the large permanent opening. I believe that as the technic becomes perfected, fewer radical antrotomies will be performed, and those that are performed will cause less post-operative trouble.

SUMMARY OF CASES

With these illustrations of the more frequently encountered types, I will briefly summarize the observations in the 152 cases of my series. I have divided them into four main groups, acute maxillary sinusitis, chronic maxillary sinusitis, chronic ethmoiditis and nasal polypi, in which these complications seemed to be the more outstanding feature. I have tried to interpret my observations in terms of a possible dental cause. My four headings are: 1. "No dental cause" was found. 2. There was a "possible" dental cause by reason of the history of an extracted diseased tooth or the presence of a tooth just under the involved antrum that gave a shadow on transillumination or was known to be dead. Many of the patients in this group were seen only once or twice. They were sent to their dentists and lost track of. The "possible" group could be included in the "probable" group in many instances, were more known of the patients. 3. The "probable" group

TABLE 1.—*Relation Between Dental Caries and Paranasal Sinus Infections in a Series of One Hundred and Fifty-Two Cases*

Type of Sinusitis	Of Dental Origin				
	None	Possible	Probable	Proved	Total
Acute maxillary	4	17	8	1	30
Chronic maxillary	6	32	28	23	89
Chronic ethmoidal	2	6	2	2	12
Nasal polypi	4	8	9	0	21
Total	16	63	47	26	152

includes those patients in whom an abscessed tooth was known to reach the floor of the diseased antrum, or the removal of this tooth and the tonsils is known to have cleared the trouble. 4. The "proved" group includes those patients in whom recovery followed directly on the extraction of a known dead or abscessed tooth.

Twelve patients showed an alveolar fistula into the antrum. Eleven of them had chronic antrum trouble which cleared, and they are listed in the group of proved cases. The twelfth case occurred in an apparently healthy antrum, and it is, therefore, not listed.

In one of the foregoing ethmoidal cases the condition cleared up after the removal of an abscessed central and lateral tooth on that side. In several cases of anterior rhinitis the condition cleared up following a similar removal of anterior diseased teeth. These cases are not listed in the series.

All the other cases concern only the upper bicuspids and molars with rarely an involved cuspid.

For an easier estimate, table 1 is reduced to terms of percentage with fractions omitted in table 2.

COMMENT

It is interesting to discover that my "proved" list closely approximates the 20 per cent figure I started out with. To this I think can be added the "probable" group. This makes a 48 per cent result. But if one could investigate the cases more in detail and watch the patients through their dental history, I believe that in most of the "possible" cases a nasal and paranasal disturbance will be found with some contributing dental cause. In only 11 per cent of the patients in this series was I unable to find a possible dental source. Proof in every case is difficult or impossible. Many a patient prefers an occasional disturbance of the antrum to the loss of a dead serviceable first molar. In the light of my experience, I feel that one may venture 60 and possibly 80 per cent instead of 20 per cent as a conservative estimate for the incidence of dental infection complicating cases of infection of the sinuses.

TABLE 2.—*Relation Between Dental Caries and Paranasal Sinus Infections in One Hundred and Fifty-Two Cases Showing Percentage of Dental Origin*

Type of Sinusitis	Of Dental Origin				
	None	Possible	Probable	Proved	Total
Acute maxillary	3	11	5	1	20
Chronic maxillary	4	21	18	16	59
Chronic ethmoidal	1	4	1	1	7
Nasal polypi	3	5	6	0	14
Total	11	41	30	18	100

CONCLUSIONS

Though sinus infections are sometimes found in young persons, they are much more frequent in persons in the prime of adult life. This is not a period when the anatomic nose is growing or changing and thus impeding sinus drainage, unless external traumatism is superimposed; the tonsils are offending no more, or but little more, than in adolescence; senile infirmity has not yet set in; hay-fever and asthmatic sensitiveness should not have changed and the patient is usually in fairly rugged health. These factors alone do not adequately explain the higher incidence of sinus infections. On the other hand, the teeth are decaying during this period. They are anatomically in close proximity. Advancing dental caries sooner or later does reach the pulp chamber, and the easiest path for an infection caught under the filling or crown is up through the dental canal to just beneath the antral floor. The roentgen ray has been relied on to reveal a dental abscess. My contention is that the relatively prompt discharge of this infection into the antrum stops the bony resorption which one looks for in the film; and that in this type

of case, unless new methods for diagnosis become available, it is the rhinologist, working with the dentist and roentgenologist, who will determine whether harm is resulting.

A dead or dying tooth in close proximity to the antral floor, no matter how harmless it appears, is a threat. Recurring pains in the antrum on this side, an occasional seepage of pus from the middle meatus, small polypi in this region and even a chronic unilateral nasal congestion otherwise unexplained, should attract attention to the teeth or to a possible buried root. The observation and removal of such a nearby septic focus will clear up many a stubborn nasal and paranasal condition. This claim is reasonable and it has the support of experience.

36 Pleasant Street.

RELATION OF OTOLARYNGOLOGIC DISEASE TO MENTAL DISEASE *

G. B. M. FREE, M.D.
Assistant Superintendent, Danville State Hospital
DANVILLE, PA.

During the past decade marked changes have taken place in the methods of diagnosing mental diseases and in treating patients afflicted with them. Throughout many generations the mind and both its normal and abnormal functioning were considered as something separate and apart from the rest of the body. Gradually, however, as the result of painstaking research, investigators came to believe that mental disorders were but an expression of abnormal cell changes or functions in the same manner that nephritis and other purely physical conditions represented a structural change or faulty action of one or more organs of the body.

Furthermore, they felt convinced that various alterations in mental operations in many instances represented the results of various toxins produced in the course of pathologic physical disease. They cited as examples the deliria of typhoid fever and pneumonia, the confusions and intellectual impairment in cardiorenal and general arteriosclerotic conditions, the emotional depression of painful delusional states frequently complicating the picture of diabetus mellitus, the agitation of psychic pain incident to the menopause, the stuporous or excited emotional reactions occurring during pregnancy and the puerperium as well as the emotional excitement and manic reactions frequently produced by hyperthyroidism.

These observations were further supported by the fact that with the removal of the underlying and operating pathologic conditions a corresponding improvement or disappearance of the mental symptoms occurred. While for a long time these investigators were relegated to the schools of organicists and their theories were looked on by psychiatrists in general as fads and fancies without well defined scientific foundation, today the picture is changed. The majority of investigators in the field of mental medicine are of the opinion that the mind can no longer be considered as a separate entity and that while heredity and environmental and psychogenic factors must ever be considered as of definite and well defined significance as predisposing and often exciting factors, nevertheless abnormal physical functioning in the last analysis

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* Read before the Montour County Medical Society at the February meeting.

represents the determining factor in many cases and always tends to accentuate a preexisting mental disease. If one recognizes this, no mental examination can be considered complete until the patient has been examined physically from every angle, nor is a diagnosis or prognosis warranted until the physical symptoms are correlated with the mental symptoms.

In this connection, abnormal conditions of the nose, throat and accessory sinuses are entitled to more than mere passing notice, and many years of observation of patients admitted to the Danville State Hospital have impressed me with certain facts that are, to say the least, significant.

It is not my intention at this time to enter into a description of the anatomy or physiology nor to discuss at length the symptomatology of the various types of diseases of the nose, throat and accessory sinuses, as these are the same in patients with mental diseases as those encountered every day in the office of the general practitioner. I intend, rather, to call attention to the types of mental disease in which some of these conditions are most commonly found, as well as to certain mental manifestations that occur in connection with these diseases.

ACUTE AND CHRONIC INFECTIONS

The most common pathologic conditions of these organs fall into the group of acute and chronic infections which are represented largely by inflammatory conditions of the mucous membrane of the nasopharynx and accessory sinuses. These conditions are prevalent in patients admitted to the Danville State Hospital, especially in the male patients, because a large percentage of them have for years followed coal mining as an occupation, and, as Bishop pointed out many years ago, a large percentage of nasopharyngeal conditions are due to the irritating effects of dust. Operating in conjunction with cold damp air, dust is largely responsible for many widespread cartarrhal conditions of the nasopharynx.

While few patients who complain of the recognized typical symptoms common to infections of these parts are seen, the patient with a mental disease nevertheless has methods of expressing the physical discomfort connected with these conditions which are characteristic and frequently interesting, and which probably only a psychiatrist could properly interpret. His expressions are not "I have pain over my eyes or over my cheek," but "someone is passing electrical currents through my skull or my face," and he reacts to these by devising all sorts of mechanical treatments that he applies himself. My attention was called to a woman, who had been a resident in the hospital for years and who on admission showed marked delusions of persecution. My first observation was

an excoriated upper lip and a discharging nose, which suggested an infection of the mucous membrane and sinuses or the presence of a foreign body. To my inquiry as to how long she had suffered with the "cold" she replied, "I have no cold in my head. Those devils are passing their electricity into my head." Transillumination of the maxillary sinuses showed the absence of translucence on both sides, and the roentgen ray revealed bilateral shadows. Subsequent examination revealed the presence of a foreign substance, which after removal in segments was stated by the patient to be chewing gum inserted in wads. She said that these had been forced while soft into the nostrils for the purpose of preventing the flow of fluid, the coryza, which she said had been caused by the electricity. The removal of this obstruction, which completely filled the length of both nares, was followed not only by the immediate cessation of the signs and symptoms of infection of the nasal cavities and maxillary sinuses, but by the clearing up of the condition as shown by transillumination and the roentgen ray, and the amelioration of the mental state.

A short time ago I saw a similar case in which a wedge of wood had been inserted into the nostrils of a male patient, removal of which revealed a large perforation of the septum.

That infection of the sinuses may bear a distinct relation to mental disturbance has been demonstrated by the observations of a number of prominent rhinologists, notably Gruenwald, Robertson, Hajek and Skillern, who have contributed their observations on these associated conditions in the various medical journals. Their theories as to the exact method by which the mental disturbances are brought about are varied to some degree, and Hajek stated that one cannot definitely explain the exact nature of the disturbances of the functions of the brain in these conditions, while in his recent volume, "The Accessory Sinuses of the Nose," Skillern expressed the opinion that it is the corporeal conditions and not the specific diseases that provoke these manifestations. Nevertheless, in this connection these authorities are all agreed that infection of the sinuses, especially the chronic type of disease, frequently manifests itself in a variety of symptoms that are distinctly mental. The usual progress of mental symptoms complicating a chronic sinusitis may be stated as follows: In addition to the usual physical discomfort, the patient becomes more or less nervous, introspective, emotionally depressed, and at times irritable, and these symptoms, which begin insidiously, may progress to a point at which he will show definite impairment of memory and inability to concentrate sufficiently to carry on his business affairs. Unless the underlying conditions are recognized and appropriate treatment given at this time, the mental disorder may pass into a well defined psychoneurosis of the neurasthenic type, and in

some instances from this to a definite psychosis. It would therefore be well to remember that the so-called neurasthenic patient with headache and pain in the neck and down the spine, who complains of inability to remember names and objects and who has become careless, indolent and wholly indifferent to everything except himself and his symptoms, may have an overlooked sinusitis, and that the securing of proper drainage and aeration of the sinuses may result in a prompt disappearance of the physical discomfort and the mental symptoms.

That disease of the sinuses is often associated with erysipelas has been well shown by various observers, and this is especially true of patients with certain types of mental disease.

One of the most annoying conditions found in hospitals for mental diseases is the periodic appearance of facial erysipelas; in some instances this almost approaches an epidemic. Observation over a period of years of hospitalized patients suffering with this disease of the facial type shows that while the disease may develop in any patient, the large majority of such cases are found in persons with dementia praecox and in mental defectives and senile groups, in other words, among the unclean and untidy patients whose mental condition renders them incapable of caring for their personal hygiene.

Examination of these patients frequently reveals an infection of the mucous membrane of the nose and accessory sinuses. These observations have been confirmed by similar observations of Amoss of Johns Hopkins, who stated that when one finds recurrent facial erysipelas one should always look for infection, including that of the sinuses, and that the clearing up of these should be the first step in prophylaxis.

In considering the relation of infection of the tonsils to mental disease, I am well aware of the stress laid by some writers and investigators on such infection as the definite etiologic factor in many psychoses. My observations in this hospital, however, would tend to cast grave doubt on such all inclusive deductions. In 375 patients admitted consecutively during the past year, tonsillectomy has been indicated and performed in forty-four, or about 8.5 per cent. In none of these forty-four cases has focal infection of the tonsils been considered as the sole determining factor in the production of the mental abnormality; it has been considered rather as a complicating physical condition which, like all other physical diseases, by rendering the person physically incapacitated, merely adds to some degree to the severity of the mental symptoms and frequently becomes the basis of added delusions and hallucinations. This may be well illustrated by a patient now in the hospital.

An adolescent youth, aged 20, began complaining of inability to sleep at night. He said that he could not get his breath unless he had several pillows beneath his head and at times could not lie down at all but had to sit on the side of the

bed and walk the room during the night. He had been emotionally depressed, hypochondriac and introspective and had developed the idea that he had what he termed an inward goiter. Examination showed that while there was a slight enlargement of the thyroid, evidence of toxins or indications for either medical or surgical treatment were not found. Later, general examination made at the physical diagnostic clinic revealed infected tonsils; tonsillectomy was performed, and forty-eight hours subsequently the patient began to sleep at night. Nine months later he had not had a recurrence of the respiratory symptoms, and the "inward goiter" has disappeared.

How much the removal of the infection and how much psychic suggestion was responsible for the improvement in this case is of course open to conjecture. At present, there is a female patient in the hospital who complains of the identical symptoms cited in the foregoing report; her tonsils are almost the counterpart in appearance of those in the case reported, but I have felt reluctant to treat her by surgical measures because of a complicating pregnancy. It may readily be seen from the foregoing reports that when tonsils are infected, their removal will frequently result in a general physical improvement and a prompt disappearance of the false ideas that the patient has developed.

One of the important relations existing between infected tonsils, overgrowth of adenoid tissue and mental functioning is found in the case of children.

It is surprising to see the large percentage of boys and girls considered mentally subnormal even to the degree of mental deficiency, unable to make any progress in school, dull, stupid and indifferent, who have passed through the extramural mental clinics of this hospital and who after the removal of tonsils and adenoids, have become normal in every respect.

CONCLUSIONS

1. A definite and dependable relation exists between physical disease and abnormal mental functioning.

2. Thorough physical examinations should form a part of the investigation of every patient presenting mental symptoms.

3. In mental diseases, infections of the nose, throat and accessory sinuses frequently form a part of the symptom-complex; diagnosis and treatment in early cases may prevent the development of a psychosis and in patients already hospitalized contribute to their comfort and sometimes to their cure.

Clinical Notes

ENDONASAL SURGERY WITH THE AID OF A NEW INSTRUMENT

A Simplified Technic

ALFRED WACHSBERGER, M.D., NEW YORK

While an assistant to Dr. M. Halle in Berlin, I operated on a number of patients with ozena according to the Halle-Lautenschlaeger method, the principle of which is mobilization of the lateral nasal wall and its luxation medially toward the septum, thus narrowing the entire nasal cavity. The part of the lateral nasal wall mobilized for this operation is mainly, though not only, the nasal wall of the maxillary sinus, which is composed of the maxillary, palatine, ethmoid and inferior turbinate bones. The object of the operation is to circumcise as large a bony plate in this area as possible to give sufficient support to the mucoperiosteal cover. Halle formerly started his incision on the bone on the lateral nasal wall at a point midway between the heads of the middle and inferior turbinates, carried it down to the floor of the nose and thence backward along the floor until the solid bone of the posterior wall of the maxillary antrum was reached. Recently, he advised against severing the bone, preferring just to indent it from his starting point over the insertion of the inferior turbinate to the beginning of the inferior meatus in order to avoid injury to the lacrimal duct, which is situated underneath this region of the lateral nasal wall enclosed in its bony canal and which in some cases gave rise to a postoperative complication.

The instruments used for this operation are chisels — straight and curved ones — and hammer. The difficulty of cutting the bone with hammer and chisel in a certain direction without breaking it into pieces is obvious as well as the uncertainty of the result and success of the operation with a partial or even sometimes missing bony support for the mucoperiosteal cover. That some bone splints may fall into the antrum, may be overlooked and may cause inflammatory reaction of the mucosa of the antrum must be considered as an additional disadvantage of this procedure. An assistant is required to handle the hammer, while the surgeon is holding the speculum in one hand and the chisel in the other hand. Unbalanced hammering will cause the chisel to slip into the antrum, wedging the bone and thus splitting it to an undesired extent or even injuring the lining mucosa of the antrum at its facial wall. Another point to be considered is that by introducing a straight chisel into the small field a large part of it will be covered, and thus the visibility will be lessened.

From these considerations arose my plan of having a new instrument made which would eliminate the foregoing disadvantages. Comparing the maxillary sinus with a can, the top of which would be its medial or nasal wall, I sought for an instrument which would circumcise the medial antral wall to the extent desired, just as a can opener circumcises the top of a can.

The instrument consists of a fine burr, 2 mm. in diameter and 6 mm. in length. This is attached to a steel wire spiral and the latter to a firm steel rod, fitting into Halle's revolver handpiece, which in turn is connected with a motor. A cannula slightly curved at the end is drawn over this and also fixed to the hand-

piece by means of a screw, which fits into a notch on the handpiece. The purpose of this cannula is twofold: 1. It gives the burr the curve necessary to approach the lateral nasal wall, like an antrum trocar for puncture through the inferior meatus. Turning the cannula and fixing it to the handpiece the concavity of the burr will also turn, and the same instrument can thus be used for the right as well as for the left side. 2. The reinforced end of the cannula surrounds the burr proper like a cuff and will not permit the burr to slip into the antral cavity. The burr proper, on the other hand, is made long enough to sever the bony medial antral wall in its thickest part at the floor of the inferior meatus, which Onodi, by his extensive examinations, found rarely to exceed 3 mm.

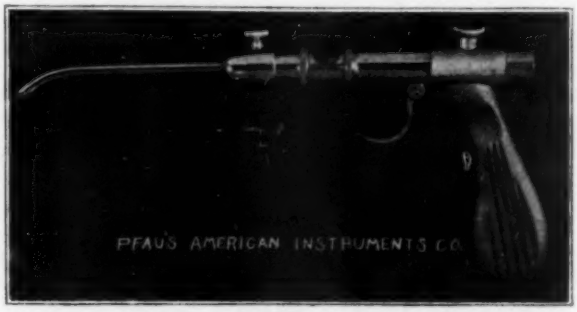

Figure 1

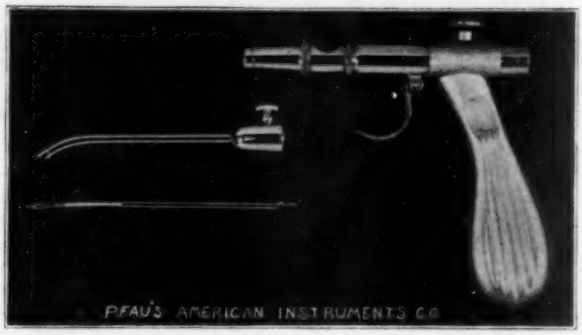

Figure 2

Figs. 1 and 2.—Instrument used in endonasal operation, as described in text.

The instrument is used in the following manner: Holding it firmly and steadily, the burr is inserted on the point where the incision starts. Pressing the trigger of the revolver handpiece the rotation of the motor is transferred to the burr, which without force of the hand will pierce the bone. After this is done, the burr can be carried in any direction, sawing the bone.

In Halle-Lautenschlaeger's operation for ozena, the burr is inserted underneath the insertion of the head of the inferior turbinate bone, which is first infracted and pushed upward. The burr is then carried to the floor of the nose in a slight curve with its convexity anteriorly, then along the floor backward until solid bone is reached. This can easily be noticed by an increased resistance and a

higher pitched sound. From here it is carried upward to the insertion of the inferior turbinate bone, thus completing a U-shaped incision.

The Halle-Lautenschlaeger operation does not describe the posterior vertical incision, which could hardly be performed with hammer and chisel.

The instrument can also be used for opening of the maxillary sinus through the inferior meatus, whenever a large permanent opening, which can easily be given any size and shape with this instrument, is desired for the purpose of draining it for continuous washing.

For a simple puncture of the antrum through the inferior meatus in cases of sclerosis of the nasoantral wall, when great force is required, the instrument can advantageously be used for drilling the canal through which the cannula to be used can then be introduced.

Fig. 3.—U-shaped incision completed. The dotted line indicates indentation of bone in operation for ozena; the dashes show line to be sawed for permanent opening in maxillary sinus.

Summarizing, the advantages of this instrument in performing the Halle-Lautenschlaeger operation for ozena are the following:

1. The bony plate of the lateral nasal wall to be mobilized will not split or break.

2. By making the posterior vertical leg of the U-shaped incision, a larger area of the posterior part of the lateral nasal wall can be mobilized to the same extent as the anterior. This will prevent unsuccessful results which are observed in cases in which merely the anterior part of the nasal cavity has been narrowed due to insufficient mobilization of the posterior part of the lateral nasal wall.

3. The entire incision is made without interruption, requires less time, and needs no assistant to handle a mallet.

4. The slenderness of the instrument permits the greatest visibility of the operative field.

REMOVAL OF A BENIGN TUMOR OF THE LARYNX WITH POTASSIUM BICHROMATE

ROBERT M. COLBERT, M.D., NEW YORK

The treatment of benign tumors of the larynx has, of necessity, been varied, depending on the condition as presented. In some instances a surgical removal is the most advisable procedure, whereas in others the topical application of solutions is resorted to. Of these solutions, some are used as escharotics, others as corrosives, others as astringents and, finally, others as stimulants to tissue repair. Further, radium has been employed also.

It may be said of all the benign tumors of the larynx that they bear some relation to chronic inflammation. Jonathan Wright stated that if these tumors are not the result of chronic inflammatory changes, then chronic inflammation at least plays an important rôle in their etiology.

I will report the treatment and cure of a patient with myxoma of both vocal cords by the topical application of an escharotic solution.

REPORT OF CASE

Mrs. B. B., aged 35, referred to me by Dr. Somach on Feb. 6, 1928, had had an attack of diphtheria thirteen years before, followed by hoarseness of approximately two weeks' duration. She had had a chronic sinusitus for two years before examination. One year before, a tonsillectomy was performed, and also a partial middle turbinectomy on both sides. A small piece of tonsil remained at the left upper pole, and some polypi were visible in the region of the right ethmoid.

About six months before I saw her, hoarseness developed; it became progressively worse, and developed into aphonia a week before examination.

Her chief complaint was the aphonia, although she also complained of periodic headache and nasal discharge. Pain was not present in the throat, but there was a decided strain and bulging of the vessels of the neck when she attempted to speak.

She had been treated by various physicians in the six months before I saw her, all of whom made some topical application to her vocal cords.

An examination of the larynx by indirect vision revealed redness and thickening over the arytenoids, slight thickening of the vocal cords, which had free movement, and good approximation. Evidence of erosion was not obtained. A Wassermann reaction on the blood was negative. An x-ray examination of the chest gave negative results. Examination of the sputum gave negative results. An x-ray picture of the accessory nasal sinuses showed a chronic involvement of the right frontal sinus, right ethmoid sinus and both antrums, with apparently thickened mucous membrane.

In consultation with Dr. Joseph Miller, an examination by direct vision was made. A smooth, bulbous, semitranslucent mass, covering the superior surface of each of the vocal cords was revealed—apparently a myxoma. The attachment of the tumor precluded the advisability of surgical removal. Since so many solutions had already been used, it became problematic to determine how to proceed.

Having read a report of Dr. M. M. Cullom[1] of Nashville, Tenn., wherein he told how he applied a saturated solution of potassium bichromate to a tumor of the vocal cords and successfully removed it, I felt inclined to employ this solution.

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1. Cullom, M. M.: Tumor of Vocal Cord Removed by Nonsurgical Means, Laryngoscope **38**:63 (Jan.) 1928.

I had known of the use of this solution in destroying polypoid tissue, and, since structurally polypi are similar to myxoma, I decided to use it.

Seven applications of the solution were made at intervals of a week. The larynx was cocainized, and by indirect vision the curved laryngeal applicator was applied to the superior surfaces of the cords while they were in phonation. The cotton on the applicator was just moistened with the solution and then thoroughly wrung out to prevent any excess solution from spreading to the adjacent structures.

In the intervals between the applications, the sinuses were subjected to active local treatment. The antrums were washed with scant purulent return. The nose was cocainized, mild silver protein packs were applied (Dowling treatment) and suction was employed. Drainage was established, and the headaches subsided.

One week after the first topical application to the cords, the patient was able to speak, though with marked dysphonia. Improvement in the voice continued, with definite progression, and within seven weeks it was practically normal.

At present, three months after the initial treatment, the patient's voice is entirely normal. Direct examination of the vocal cords reveals a normal appearance, and the site of the original lesion is not discernible.

The patient is still under observation and occasional treatment for the involvement of the sinuses.

160 West Eighty-Seventh Street.

EXPOSURE AND ILLUMINATION OF THE PHARYNX AND LARYNX BY THE GENERAL PRACTITIONER

A New Laryngoscope Designed to Simplify the Technic

PALUEL FLAGG, M.D., NEW YORK

Peroral and laryngeal examination as practiced in the bronchoscopic clinic of today is only a preliminary to bronchoscopic intervention.

Careful technic, instrumentation and teamwork are essential for success. Bronchoscopy requires a constant source of electricity and the smallest possible lamp in order to give the greatest facility in the search for the foreign body or pathologic lesion in the lung.

The peroral and laryngeal field, however, lying, as it does, between the teeth and the vocal cords, should be readily accessible to any physician unskilled in bronchoscopic technic. Every physician should be in a position to examine this field for foreign bodies which may or may not cause obstruction to respiration. He should be in a position to make this examination with as little preparation as the routine examination made with the ordinary tongue depressor. The exposure and illumination of this field ordinarily last only a few seconds or a few minutes, at best. Electricity provided by the pocket flashlight is ample, and can be extended at will by replacing the small dry batteries available in most drug stores. The field of examination is roomy compared with the bronchoscopic field. For this reason, it allows comparatively large, sturdy lamps which do not burn out easily.

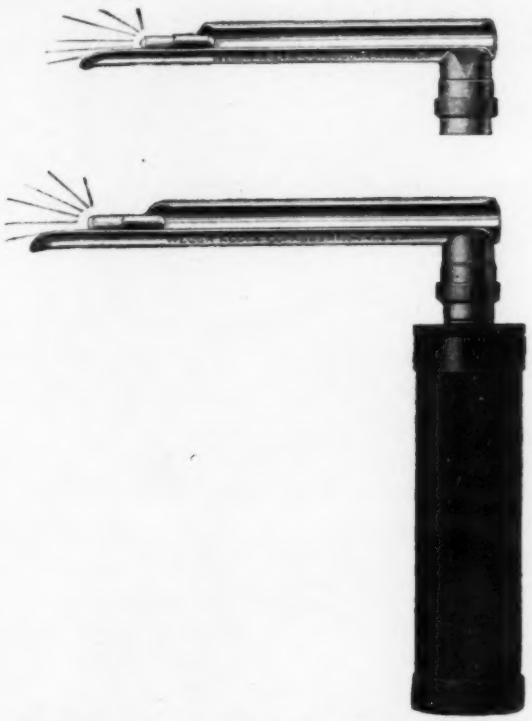
Most of the conditions under which peroral and laryngeal examinations of short duration are required do not warrant the ceremony attendant on bronchoscopy.

My early reaction to a separate battery, wires and the small lights customarily used in bronchoscopy was that of surprise when the combination worked. For

intratracheal anesthesia, requiring, as it does, relative speed, a constantly changing location of operation and no allowance for failure to intubate, the combination becomes so heavy a burden as to be impracticable.

The instrument to be described provides pocket flashlight facilities and durability.

The standard Welch Allyn battery handle with rheostat is used as a base for the attachment of a specially designed detachable, sterilizable laryngoscope, embodying the following features: minimum vertical diameter, large lateral slot for intubation and instrumentation, waterproof wiring and lamp connection, which may be boiled, and a large lamp of a maximum durability.



Instrument used in peroral and laryngeal examination.

During the past year, I have made use of this instrument alone in my intratracheal work.[1] The instrument has received rough usage in constant transportation and has never failed to function. While it is not practical to simplify further the apparatus designed and used for bronchoscopic work, I am convinced that the simple instrument now available will do much to remove the resistance which most physicians have encountered in their inspection of the pharynx and the larynx of the adult and the child.

1819 Broadway.

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1. Flagg, P. J.: Intratracheal Inhalation, Arch. Otolaryng. **5**:394 (May) 1927; Intratracheal Inhalation Anesthesia, **7**:156 (Feb.) 1928.

DEMONSTRATION OF NONOPAQUE FOREIGN BODIES IN THE ESOPHAGUS

H. G. Reineke, M.D., Cincinnati

Radiologist, General Hospital

The localization of nonopaque foreign bodies in the esophagus presents a distressing problem to the roentgenologist. The use of barium sulphate in suspension has been a valuable aid in this work, but it has been found that iodized oil—40

Presence of a foreign body revealed after the ingestion of iodized oil.

per cent—is of greater value in certain types of cases. It has been found to be practically harmless to the patient, since a small amount suffices for satisfactory examination. The oil is tasteless and is readily ingested. Its advantages have been pointed out by Iglauer,[1] who was the first to suggest its use in this hospital.

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1. Iglauer, Samuel: Ingested Lipiodol to Demonstrate Nonopaque Foreign Bodies in the Esophagus, Ann. Otol. Rhin. & Laryng. **36**:1157, 1927; Nonopaque Foreign Bodies in the Esophagus and Esophagotracheal Fistula, Arch. Otolaryng. **7**:229 (March) 1928.

An interesting case is cited in this article to show how valuable the method can be. Only the roentgenologic aspects of the case are submitted, since the clinical features are to be included in another article by another writer.

REPORT OF CASE

C. W., aged 65, was admitted to the hospital for localization of a foreign body in the esophagus. He said that he had eaten fish a few hours before and that he thought a piece of bone had become lodged at a point opposite the upper level of the sternum. Fluoroscopy failed to show the presence of a foreign body. Films made at the same time also were negative for a foreign body. A barium capsule was given the patient, and this lodged at the level of the seventh cervical vertebra. On the following morning, he was again examined. At this time, about 4 or 5 cc. of iodized oil was given by mouth. An obstruction of the esophagus was shown at the same level, but the presence of a foreign body was not established. On the second morning, the patient was reexamined, and a sharply outlined area of increased density was revealed at the level of the seventh cervical vertebra. It measured 2 by 3 cm. and represented the foreign body as shown in the illustration. Its visualization was possible because of the absorption of some of the iodized oil in its outer surfaces.

Subsequent recovery of this body showed it to be a vertebra of a fish.

Progress in Otolaryngology

A Summary of the Bibliographic Material Available in the Field of Otolaryngology 1927-1928

LARYNGEAL TUBERCULOSIS *

GEORGE B. WOOD, M.D.
PHILADELPHIA

Manassa [1] described an interesting pathologic condition that occurs in tuberculous laryngitis and called it tuberculous thrombolymphangitis. In the submucous tissue irregular spaces were found which, because of the direction of the section, were sometimes sausage-like in form and at other times flask-shaped or pear-shaped. They varied considerably in size and were connected with one another by narrow prolongations. These spaces were limited by a distinct thin or thicker layer of tissue with smooth muscle fibers which usually showed endothelium on the inner surface. They contained clotted fibrin with accumulations of mononuclear cells, in which sometimes coal pigment and sometimes coagulated material was seen. The contents of the spaces often exerted enough pressure to rupture the walls, with the escape of the material into the surrounding connective tissue. The invaded area showed distinct inflammatory changes and was usually infiltrated with fibrin and round cells. Manassa expressed the belief that this condition is one of thrombosed lymph vessels. In many places the contents apparently became infected with tuberculosis, as true tubercles, caseation and typical Langhans' giant cells were frequently found in the thrombotic lymph vessels. It is to be especially noticed that this condition of the lymphatics was never found in the portions of the larynx which showed active tuberculosis but in the surrounding inflammatory areas. Manassa believed that the condition already described demonstrates that the lymphatics serve as a pathway for extension of tuberculous disease. This does not mean that the primary infection of the larynx comes through the lymph vessels but only that the spread of the disease inside of the larynx takes place in this way.

This observation of Manassa is extremely important, although, from clinical experience, such a method of spread of the disease in the larynx was thought probable. The pathologic proof ought to make one even more careful in avoiding intralaryngeal manipulations that might tend to force

* Submitted for publication, Nov. 27, 1928.

1. Manassa, Paul: Ueber Thrombolymphangitis Tuberculosa im Kehlkopf, Klin. Wchnschr. **6**:1701 (Sept. 3) 1927.

the bacilli through the tissue. Also, one must realize that the clinical examination of the larynx does not, in the majority of cases, give information as to the exact extent of the invasion.

In support of the latter belief, an interesting case is reported by Eisolt.[2] A patient with a fairly large ulcer of the right ventricular band, who also suffered from diffuse pulmonary tuberculosis, was irradiated by means of Seiffert's autoscope, the source of the light being Bach's quartz lamp. The severe odynphagia from which the patient suffered was relieved, and after three irradiations the ulcer had apparently cicatrized and healed. The patient died a year and a half later of hemoptysis. At postmortem examination, although at the seat of the old ulcer there was a large, rough, cicatrized spot, histologic examination showed that in the surrounding areas miliary and conglomerate tubercles and some caseation were present. Around the specific tuberculous tissue there was evidence of chronic inflammation with hyperplasia of the lymphadenoid tissue. Eisolt was inclined to believe that this inflammatory reaction, which produced a limiting fibrous wall around the tuberculous process, was due to the therapeusis rather than to tissue reaction brought about by the irritation of the site by the tuberculous disease.

Schroeder [3] described a case of benign granuloma of the vocal cord, the base of which, however, was tuberculous tissue. It was about the size of a cherry, had a smooth surface and was composed of inflammatory granulation tissue, not covered by epithelium. While the growth itself did not show specific tissue, the base of the vocal cord immediately beneath did. The growth was evidently a tissue reaction to tuberculous toxins somewhat similar to that seen in the posterior commissure where epithelial hyperplasia is frequently found, but where tuberculosis involves only the deeper subepithelial tissue.

In speaking of stenosis of the larynx from tuberculous disease, Greene [4] said that the production of scar tissue is, in his experience, the most frequent cause. Among other factors producing laryngeal stenosis, he mentioned double abductor paralysis. He expressed the belief that this paralysis is usually due to inflammatory reaction of the muscles of the larynx rather than to a weakness of the nerves, though he still recognized that a true recurrent paralysis may sometimes occur from pressure of bronchial glands or thickened pleura.

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2. Eisolt, Josef: Ueber die Linderung der Schluckschmerzen bei Kehlkopftuberculose durch endolaryngeale Bestrahlungen, Med. Klin. **23**:1892, 1894.

3. Schroeder, G.: Ueber die Entwicklung eines gutartigen Kehlkopfgranuloms am linken Taschenband auf dem Bodentuberkulosen Gewebes, Ztschr. f. Laryngol. Rhinol. **16**:391, 1927.

4. Greene, Joseph B.: Obstructive Tuberculosis of the Larynx, South. M. J. **21**:341 (May) 1928.

Van Caneghem [5] described a condition in which the vocal cord, usually only one, shows a groovelike depression running parallel with the free edge, sometimes looking as though the cord were double. As there are no subjective symptoms, except possibly some hoarseness, the condition is usually found accidentally. After careful consideration of the various possible factors in its etiology, such as its being congenital, trophic or the result of a catarrhal inflammation, or a healed, acute, nonsyphilitic ulcer or a healed syphilitic lesion, Van Caneghem felt that this grooving of the cord is, in the greater majority of cases, a phase of spontaneously healed tuberculosis, and that the active lesion has been presented in infancy or childhood. He believed this in spite of the realization that laryngeal tuberculosis is extremely rare in children.

Jaffe [6] reported an interesting case of tuberculosis of the nose in a woman, aged 60. The interesting feature in this case is that the upper part of the nasal bone and the bony septum had been destroyed. It has been supposed that when the bones of the nose are involved in the ulcerative process a diagnosis of syphilis should be made, as the tuberculous disease is supposed to limit itself, as far as the nose is concerned, to the soft tissues and the cartilage. The diagnosis in this case was made by histologic examination of the diseased mass, which was removed at operation.

As usual the great bulk of literature on tuberculosis of the upper respiratory tract is directed toward therapeusis, and apparently various forms of irradiation are receiving the predominating amount of attention.

THE PIRQUET TEST

As a possible aid to prognosis and as to what may be expected from treatment in given cases, Schuberth [7] made an interesting bit of research. Although his conclusions are mostly negative, it is perhaps for this reason that they are worth while noticing. He utilized the Pirquet skin reaction to indicate the biologic resistance of the tuberculous patient, especially in relation to the laryngeal involvement. His material consisted of 137 cases of undoubted laryngeal tuberculosis. One hundred and nineteen of these showed active disease and eighteen latent. Sixteen cases belonged to the so-called second stage of Ranke and the others to the third. The Pirquet reactions were studied and the patients care-

5. Van Caneghem, D.: Etiology of Grooves in the Vocal Cords; Contribution to the Clinical Study of Spontaneously Cured Laryngeal Tuberculosis, Ann. d. mal. de l'oreille, du larynx **47**:121 (Feb.) 1928.

6. Jaffe, Ludwig: Zur Tuberkulose der knochernen Nase, Ztschr. f. Laryngol. Rhinol. **16**:428, 1927.

7. Schuberth, Albert: Ueber die prognostische Bedeutung des Hauttiters nach von Pirquet bei der Kehlkopftuberkulose unter Berücksichtigung der Rankeschen Stadieneinteilung, Ztschr. f. Laryngol. Rhinol. **16**:38, 1927.

fully watched for from four to six months and the tendency to healing or otherwise carefully noted. Schuberth gave his results in his conclusions as follows:

I. Laryngeal tuberculosis occurring with a complicating disease of the lungs of isolated phthisis of the third stage shows the following:
   1. A strong Pirquet reaction must be regarded as favorable for prognosis.
   2. A negative reaction would be regarded as favorable if after a careful clinical examination distinct good clinical signs are found and as unfavorable when the clinical signs are bad. The first is the positive anergy and the second is the negative anergy.
   3. A marked Pirquet reaction should be judged as being on the favorable side.
   4. A weak reaction leans toward the unfavorable side.

II. When latent pulmonary tuberculosis of the third stage is likewise present, the reaction is marked and the prognosis for the laryngeal involvement good.

III. In the types belonging to the second stage, little importance can be placed on the skin reaction, as far as prognosis of laryngeal tuberculosis is concerned. They show different reactions. The symmetrically marked reaction which theoretically belongs to the second stage has not been observed in Schuberth's cases.

Schuberth also said that it must be remembered, however, that the number of exceptions is so large that the probabilities for accuracy in conclusions are so questionable that the skin test cannot be relied on as a prognostic procedure. Even by the greatest clinical care in his examinations, the Pirquet test has not been of any great use in laryngeal tuberculosis.

TREATMENT

Heliotherapy.—As to the use of heliotherapy in laryngeal tuberculosis, the results obtained by some are much more encouraging than those obtained by others. For instance, Strandberg [8] of Copenhagen employed general irradiation in the treatment of about 203 patients with laryngeal tuberculosis, all of whom also had pulmonary tuberculosis. Of these, 113, or 55.6 per cent, were apparently cured as far as the larynx was concerned. It is interesting to note that out of these 113 patients who were cured seventy-seven had pure intrinsic disturbances, thirty-four had both intrinsic and extrinsic, and two had only extrinsic disturbances. (It should be noted that his results with extrinsic lesions were extremely gratifying as, in my own experience, when the tuberculous disease had spread out of the larynx into the pharynx the prognosis was invariably bad.)

8. Strandberg, Ove: Heliotherapy and Artificial Light, J. A. M. A. **90**:1595 (May 19) 1928.

Strandberg said that the sun unquestionably is the best of all sources of light in places where sunlight is available. According to clinical experience, the best results are obtained in the treatment of surgical tuberculosis with sunlight in mountain regions and at the seaside. A careful study of the length of light waves which are found at the various altitudes would seem to indicate that it is the longer ultraviolet rays, in conjunction with the violet and blue rays, that are of the most importance. These rays are present in great quantities in sunshine in the mountains and near the seashore. After detailed consideration of the various types of lamp most closely resembling the sunlight, Stradberg concluded that the best substitute for sunlight is the carbon arc light, and this is borne out by his clinical results. He said that the mercury vapor lamp is also usable but that the period of treatment will take longer and the results are not so good. He said that in most forms of tuberculosis it is advisable to use the carbon arc lamp, but that this lamp has to be of a certain type and also that a definite amount of voltage must be employed. The details of the various types of lamps are carefully discussed, and for those especially interested, his original article is worth while studying. In the treatment for laryngeal tuberculosis, he said that this condition may at times be cured solely by general light baths, the object of which is to alter the immune biologic reaction. When once he has obtained a satisfactory immune biologic reaction, the cure can be distinctly hastened with suitable local treatment, such as the use of the galvanocautery and excision. He said that he does not understand why others have not had equally good results with general irradiation in laryngeal tuberculosis, but he thought that it was probably due to too great dosage. He was rather skeptical as to the advantages of direct irradiation to the larynx, believing that the amount of light that can be successfully projected is too infinitesimal to be of any beneficial effect, and that the discomfort to the patient from the manipulation necessary more than outweighs the advantages to be gained.

Irradiation.—On the other side of the question, Jelinek [9] seemed to be well satisfied with the results that he obtained from direct irradiation of the larynx. He employed the Hanauer quartz lamp, the light of which is confined in its projection by a conical funnel so that the rays do not come in contact with the face or the mucous membrane of the mouth but strike directly on the laryngeal mirror. At times he employed a laryngeal mirror of glass with a silver amalgam back and at other times a metal reflector. He expressed the belief that the healing properties of the shorter waves over those of the longer waves have been greatly overestimated, and

9. Jelinek, D.: Heilung und Besserung der Kehlkopf und Nasen tuberkulose durch blosse Applikation des Lichtes der Quarzlampe, Monatschr. f. Ohrenh. **62**:63 (Jan.) 1928.

from actual use showed that the glass mirror will give excellent results in the treatment of laryngeal tuberculosis. He employed the quartz lamp, which is comparatively limited in long wave lengths, in preference to lamps such as the electric arc, which are rich in long waves, because the latter, on account of the heat produced, cause the patient discomfort. However, he recognized that the long wave lengths may be of value, but said that it means simply a longer exposure with the quartz light. His best results, of course, were obtained with the earlier type of lesions, and in severe cases the only help the patient can expect from the irradiation is a lessening of the pain on swallowing. In determining the dosage, he found that it was not necessary to measure the actual output of light, but that it was important that the distance between the laryngeal mirror and the source of light should be between 60 and 70 cm. With this distance, he followed out the following schedule:

> For the first week, the patient was exposed for five minutes each day; for the second week, eight minutes; the third week, ten minutes; the fourth week, ten minutes; the fifth week, twelve minutes, and the sixth week, fifteen minutes. Because of the different degrees of reaction to exposure manifested by different people, Jelinek tested the sensitiveness of the skin of each patient. For this purpose he constructed an apparatus consisting of one large plate with another plate sliding over it so that small areas of the skin can be exposed for different lengths of time. The amount of redness that is present twenty-four hours after the exposure is a definite measure of the sensitiveness of the individual patient to the light.

According to his statement, Jelinek obtained sufficiently good results by this method of irradiating persons with tuberculous infiltration of the upper respiratory tract to prove that heliotherapy properly applied is a worth while addition to the therapeusis of laryngeal tuberculosis and perhaps ought to be considered in the same class as the cautery and surgical curettage.

Zeigler [10] sided with Jelinek in believing that the local application of light will produce better results in the treatment of patients with laryngeal tuberculosis than general irradiation of the body. In his clinic he has used both direct sunlight and that of the quartz lamps, and he said that 75 per cent of his patients showed distinct improvement.

Dr. Eleanor Fisher [11] employed the direct sun rays in laryngeal tuberculosis. The sun is directed into the mouth by condensing metallic reflectors, the rays then being projected into the larynx by another metal reflector. It is essential that these reflectors be kept highly polished, and rebuffing is often necessary. The treatment is carried out by the patients themselves, who are instructed in the proper technic. The first

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10. Ziegler, O.: Strahlentherapie **28**:406, 1928.

11. Fisher, Eleanor: Heliotherapy in the Treatment of Laryngeal Tuberculosis, U. S. Vet. Bur. M. Bull. **3**:1066 (Oct.) 1927.

exposures are from twenty to thirty seconds each day and are increased from twenty to thirty seconds daily until three minutes are reached. For several days the time of exposure is held at three minutes but later, if indicated, it is gradually increased up to seven or eight minutes, but this is the maximum.

Somewhat similar heliotherapy was employed by Spencer,[12] though he used a reflector of an alloy of magnesium and aluminum such as has been perfected by Forester and Chapman. He started with ten seconds of exposure daily for the first week and then increased it to five seconds each week until ten minutes were reached. However, Spencer did not rely on heliotherapy alone but used cauterization, saying that it is often required to heal lesions that have resisted all other forms of treatment. He reiterated the fact that the purpose of cauterization is to produce fibrosis and not to attempt a total destruction of the diseased area and that one should be careful to err on the side of doing too little rather than too much at one time. Spencer also obtained a fair amount of benefit in a few selected cases by injections of tuberculin, beginning with 0.1 mg. of tuberculin injected directly into the tissue of the larynx. He said that the local injection produces a local as well as a general immunity.

Tuberculin.—Concerning tuberculin, Sorgo [13] proposed the use of a bouillon filtrate of tubercle bacilli, at least 2 months old, which after repeated cultures does not show any activity. This bouillon is applied in a concentrated form to the diseased portion of the larynx in swab applications. The treatment is easily carried out, especially when the epiglottis and laryngeal orifice are involved, but when the interior of the larynx is involved local anesthesia should precede the manipulation. The chief result obtained by this type of treatment is marked amelioration of the pain. This relief of pain lasts only for a few hours after the first application, but this time increases after each treatment. In spite of the concentration of this filtrate, which Sorgo said is at least ten times as strong as Koch's tuberculin, it is remarkable how tolerant the mucous membrane of the throat and larynx is to these applications.

Tikhomiroff and Goldberg [14] expressed the belief that in a great many cases the secondary infection is so important that it must be cleared up before specific treatment is instituted. They made cultures from a

12. Spencer, Frank R.: The Symptomatology, Diagnosis and Treatment of Laryngeal Tuberculosis, Ann. Otol. Rhin. & Laryng. **37**:213 (March) 1928.

13. Sorgo, J.: Ueber den Einfluss der localen Anwendung der Tbc-Bouillon Filtree auf tuberkulose Kehlkopfprozesse, Wien. med. Wchnschr. **78**:70 (Jan.) 1928.

14. Tikhomiroff, S. A., and Goldberg, I. I.: Emploi de l'antivirus streptococcique dans la laryngite tuberculeuse, Compt. rend. Soc. de biol. **98**:111 (Jan. 20) 1928.

series of twenty cases of laryngeal tuberculosis with ulceration and found the predominating organisms to be the streptococcus and the diplococcus with an occasional staphylococcus. Feeling that the streptococcus was the most important of these organisms in secondary infections, they endeavored to produce a localized immunity with the streptococcus antivirus. The treatment consists of the instillation by the physician into the larynx of from 1 to 2 cc. of streptococcus antivirus every other day, while the patient sprays the throat with the antivirus three times a day. With certain intervals for rest the treatment is kept up for from one to three months and is usually well borne by the patient. This treatment was carried out in eighty-three cases; seven did not show any result, but in the others there was considerable lessening of the edema and the ulcers became smaller and cleaner. Also the patients were markedly relieved from pain. As a control the author treated several patients with plain bouillon, but these did not show any results so that it is reasonable to suppose that the benefit obtained was due to specific action of the antivirus.

Chaulmoogra Oil.—Snapp [15] expressed the belief that chaulmoogra oil should have a distinct place in the treatment for laryngeal tuberculosis. It is not a cure all and cannot be used to the exclusion of other methods such as cautery and heliotherapy. He said that its greatest value is in the relief of pain and dysphagia. He believed that the benefit from chaulmoogra oil is probably due to the fact that the tubercle bacilli closely resemble those of leprosy and are probably influenced by the same therapeutic agent as the bacilli of leprosy would be. Further, the action of chaulmoogra oil is said to be ten times more bactericidal than phenol for acid-fast bacteria, and the oil contains a large amount of the acid. Snapp had great success in relieving pain in odynphagia in about twenty-five cases by using a 20 per cent solution in olive oil dropped into the larynx with a laryngeal syringe. He said that while the relief from pain is considerable, a cure has been experienced in only a comparatively small number.

Trichloracetic Acid.—Davis [16] devised a method for applying trichloracetic acid to tuberculous ulcers. He said that he has treated forty-eight patients with uniformly good results, the ulcerations healing promptly and pain being rapidly relieved. The application is made with a curved wooden applicator without cotton. The applicators are curved by boiling and while hot are molded into the regular curve of a laryngeal applicator. They must be held in the curved position until cool so

15. Snapp, Carl F.: Tuberculous Laryngitis: Its Treatment with Chaulmoogra Oil, J. Michigan M. Soc. **26**:719 (Dec.) 1927.

16. Davis, Bertram C.: Trichloracetic Acid in the Treatment of Ulcerative Laryngeal Tuberculosis, Ann. Otol. Rhin. & Laryng. **38**:816 (Sept.) 1927.

that they will retain this shape. With these wooden applicators the acid can be strictly confined to the ulcer, and pure undiluted acid is used. After from one to three treatments with the trichloracetic acid, Davis resorted to the 20 per cent chaulmoogra oil.

If one could be sure that the administration of trichloracetic acid could be strictly limited to the ulceration, this method would probably be an efficient way of treating these ulcers. The acid produces an eschar, and the resulting inflammatory reaction would tend to bring about cicatrization of the tubercles in a similar manner as does the actual cautery.

Injections of Alcohol.—Blumenthal [17] described a new technic of blocking the superior laryngeal nerve with alcohol. In his article he gave the details of the method employed by Hoffman and by Braum, but he believed that his technic is more certain to strike the nerve. Blumenthal called attention to the anatomic fact that the internal branch of the superior laryngeal nerve starts to break up into its terminal branches above the upper edge of the wing of the thyroid cartilage between the middle and lateral thirds. The majority of these branches run inward and downward, spreading out in the soft tissues on the inner side of the thyroid cartilage in approximation with the front and side of the entrance of the larynx. These branches can be easily located by a needle if it is inserted at the superior notch of the thyroid in front and carried backward on the inner surface of the ala of the thyroid cartilage. The needle is inserted for about 4 cm., and its progress is easily regulated by palpation. If the point is too closely applied to the surface of the thyroid cartilage, it engages in the cartilage itself and must then be slightly withdrawn and directed more toward the center. In order to relieve the pain of the alcoholic injection, it is well to inject a little procaine hydrochloride first, but after the injection of procaine the needle should not be entirely withdrawn so that the point may not lose its position. If it is necessary to make injections into both nerves, there should be a considerable lapse of time between the two injections, as there is a possibility that the injection of fluid in this region in cases of severe edema of the larynx may increase the intralaryngeal swelling sufficiently to produce stenosis. In regard to the effect of alcohol injected into a diseased area, Blumenthal expressed the belief that it is a valuable therapeutic measure and that its injection in tuberculosis of the pharynx and of the palate and tonsillar region aids considerably in lessening the pain.

17. Blumenthal, A.: Ueber Alkoholinjektionen gegen die Schluckeshmerzen bei Larynx tuberculose, Ztschr. f. Laryngol. Rhinol. **16**:225 (Nov.) 1927.

Correspondence

NEW INSTRUMENT FOR INTRODUCING CATHETER INTO THE EUSTACHIAN TUBE

To the Editor.—In the "Clinical Notes" of the September, 1928, issue of the ARCHIVES, Dr. Gale described an allegedly new instrument for introducing a catheter into the eustachian tube under direct vision. I should like to call attention to the fact that this instrument is identical in principle with an instrument I previously described in the *New York State Journal of Medicine,* October, 1927, p. 1061, the *Bulletin of Beth Israel Hospital,* 1927, and other journals, differing from mine only in that it provides one guide for passing the catheter into both the right and left eustachian tube, whereas I use a different and clean guide for each tube. The principle underlying the instrument described by me was as follows:

"It consists of a pair of catheter guides — right and left — and a nasopharyngoscope. The guide can be slid along, also rotated about the nasopharyngoscope. In operation the cather guide, containing a catheter, is attached to the nasopharyngoscope, so that the egress portion extends alongside the mirror. In this position, under slight cocainization, the combined instrument is easily introduced into the nasopharynx under the inferior turbinate in the same manner as an ordinary eustachian catheter. The nasal orifice of the eustachian tube is then brought into view; the guide containing the catheter is given a slight turn to increase the visibility of the catheter and its free end is introduced into the eustachian tube." —*New York State Journal of Medicine,* Oct. 1, 1927.

LOUIS K. PITMAN, M.D., New York.

Abstracts from Current Literature

Ear

PHYSIOLOGY OF THE EAR, RÔLE OF THE ARCHES OF CORTI IN HEARING. A. BONAIN (BREST), Ann. d. mal. de l'oreille du larynx **42**:473 (March) 1928.

The author regards sound waves as he does light waves, that they are both subject to refraction and reflection. However, in sound the longer waves are less tolerant of resistance than the shorter.

He takes exception to the theory that certain structures in the internal ear are especially adapted for the reception of certain waves or vibrations or that there are special resonators. He does contend, however, that the arches along the spiral are capable of different refraction and reflection of sound waves and that hearing is accomplished in this manner.

APPEARANCE OF THE DEPTH OF THE EXTERNAL AUDITORY CANAL CALLED "FERME EN BOURSE": SIGN OF LATENT MASTOIDITIS. DUTHEILLET DE LAMOTHE, Ann. d. mal. de l'oreille du larynx **42**:483 (March) 1928.

This condition is described as an early sign of latent mastoiditis in which the infection in the middle ear is confined to the attic. There are swelling and redness of the walls of the canal, especially posteriorly and above, which change the relatively sharp angle that the membrane forms with the posterior wall into the curved plane. While there is no bulging of the membrane proper, there is redness and striation of Shrapnell's membrane. Sometimes it is difficult to determine the limitations of the membrane. The general appearance is that of an irregular culdesac. The author believes that early and skilful paracentesis is indicated. He insists that this condition is rather frequent and that in all cases investigated pus was found in the mastoid process.

POST GALVANIC NYSTAGMUS. INVESTIGATION OF PROLONGED GALVANIC TESTS. RAOUL CAUSEE, Ann. d. mal. de l'oreille du larynx **47**:492 (March) 1928.

Postgalvanic nystagmus was obtained, for the most part, following ionization treatment of suppurating ears. However, other methods were also employed—bipolar, biauricular and monopolar.

Postgalvanic nystagmus was obtained only after prolonged galvanism. The postgalvanic nystagmus was always in the opposite direction to the pregalvanic. The use of the negative polar caused an after-nystagmus to the side examined, while the positive pole produced the nystagmus in the opposite direction.

In commenting on the probable causes of postgalvanic nystagmus, the author does not believe that the thermal reaction is sufficient to cause the disturbance. As to the electrophysical reaction the phenomena should cease as soon as the current is interrupted, as in the case of motor nerves. He is of the opinion, however, that a physical change actually takes place in either the endolymphatic fluid or the crista ampullaris of the otolith membrane to produce the after-nystagmus

HOMOLATERAL AND HETEROLATERAL PARALYSIS OF THE ABDUCENS IN THE COURSE OF OTITIS. VERNIEUWE, Rev. de laryng. **49**:107 (Feb. 29) 1928.

The author is of the opinion that the term "syndrome of Gradenigo" is badly abused. Gradenigo described the condition as an acute otitis with continuous pain in the occipitoparietal region with paralysis of the abducens nerve, usually homolateral. However, heterolateral paralysis has been observed. In dealing with the pathogenesis of this condition, the author considers three causes, anatomic, reflex and toxic.

The homolateral paralysis can easily be explained by the proximity of the sixth nerve to the apex of the bone. Osteitis with or without necrosis, a circumscribed meningitis or leptomeningitis could easily cause a disturbance of the external rectus. Such an osteitis could also cause an intracranial hypertension that might affect the sixth nerve on the side of the lesion.

The anatomic theory, however, cannot account for the heterolateral involvement. Vernieuwe does not accept the reflex theory as plausible because the labyrinth is not often affected in these cases; and if it is affected the labyrinthitis is recognized as such, and the paralysis of the sixth nerve can be attributed to the subsequent meningitis.

The toxic theory of the heterolateral paralysis of the sixth nerve seems more acceptable. The author cites the cases of sciatica and paralysis of the sixth nerve following spinal anesthesia to bear out his arguments. He believes that the heterolateral paralysis is a neuritis due to toxemia, and advances the theory that the nerve on the side of the inflammation, on account of the proximity of the osteitis, becomes more or less immune to the toxemia, and the opposite nerve suffers the burden of the assault.

ROTH, Chicago.

Pharynx

PHARYNGEAL HYPOPHYSIS AND ADENOIDS. M. SLOBODNIK, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**:165 (Sept. 5) 1928.

Embryogenically the pharyngeal hypophysis is closely connected with the cerebral hypophysis. The former develops from the outer hypophysis pocket (Ratke's pocket) and enters through the craniopharyngeal canal in the sphenoidal bone into its permanent place. This portion forms the anterior lobe of the hypophysis (adenohypophysis). The posterior lobe (the neurohypophysis) develops from the base of the midbrain. These two parts are histologically different. Traces of the craniopharyngeal canal rarely persist. The pharyngeal hypophysis is located at the upper posterior border of the vomer, where it meets the sphenoidal bone. In the adult, it measures from 6 to 7 or 9 mm. in length, and is from 0.5 to 1 mm. in thickness. The shape varies. In some cases the basophils are absent in the pharyngeal hypophysis, whereas they are always present in the hypophysis. The chromophil elements surpass the chromophobe elements in the cerebral hypophysis, whereas the relation is just the reverse in the pharyngeal hypophysis. Some authors think that the pharyngeal hypophysis and the cerebral hypophysis have similar functions; others deny this. The author thinks that there is not any absolute relation between the two. In certain instances of tumors of the hypophysis, in cases of dystrophia adiposogenitalis, compensatory changes were not observed in the pharyngeal hypophysis. In a case of tumor of the hypophysis (Christeller) with symptoms of dystrophia adiposogenitalis, the histologic picture of the pharyngeal hypophysis pointed to vicarious hyperfunction. In adenotomy (the author does not perform adenectomy), the pharyngeal hypophysis is not touched. The author suggests that the pharyngeal hypophysis be examined histologically in all necropsies in cases of acromegaly and diseases of the cerebral hypophysis and other endocrine glands.

AMBERG, Detroit.

Larynx

PERICHONDRITIS AND CHONDRITIS OF THE LARYNX. L. B. SEIFERTH, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**:102 (June 16) 1928.

There is still much discussion concerning the therapy of perichondritis and chondritis of the larynx. Scarcely any investigations have been made concerning the finer histologic changes associated with the inflammation. The pathogenesis, also, is not well known. The author reports five cases in point.

CASE 1.—A man, aged 67, suffered from hoarseness for three years. On Aug. 15, 1925, he was admitted to the hospital on account of dyspnea of five days'

duration. Intermittent attacks of suffocation occurred during the twenty-four hours before admission. A severe edema of the glottis was present. The vocal cords were thickened and stood almost immovable near the median line, so that only a narrow slit remained open. An inspiratory and a less pronounced expiratory stridor were present. There was a pronounced dulness of the lower lobe of the left lung. Large râles were heard over both lower lobes. The diagnosis was made of acute edema of the glottis, of tumor of the larynx (?) and of bronchopneumonia of the left lower lobe. The treatment consisted of an ice collar, morphine, inhalation, expectorants and heart remedies. Two days later, a tracheotomy was necessary. The condition became much worse, and the patient died on Aug. 25, 1925. Necropsy revealed a proliferation at the posterior wall of the larynx emanating from the cricoid cartilage, with ulceration in the center, edema of the entrance of the larynx and extensive croupous bronchopneumonia of the entire left lung.

Case 2.—A man, aged 51, seen on Nov. 16, 1926, complained of hoarseness of half a year's duration, which had become worse during the last three weeks. The right half of the larynx was normal. The left vocal cord reached into the subglottic space as a glassy, cauliflower-like tumor. A trial excision revealed a carcinoma commune. On Nov. 18, 1926, a laryngofissure was performed under local anesthesia. The patient improved, and he was discharged on December 15. He was readmitted on Feb. 16, 1927, suffering from dyspnea. He died suddenly on the following day. Necropsy showed a moderate edema of the larynx, especially on the left side, and of the uvula. There was a slight hypostatic pneumonia on both sides, and a granular swelling in the region of the arytenoid cartilage, reaching to the cricoid cartilage.

Case 3.—A youth, aged 18, admitted on Nov. 4, 1926, complained of a violent cough which had developed four weeks previously, following an attack of grip. He had been slightly hoarse for years. For four days, the patient suffered from dyspnea and pain while swallowing. The same symptoms had been observed for four years. Both false vocal cords were rather edematous, and they overlapped the vocal cords almost entirely. The posterior wall and the region of the arytenoid cartilage also were edematous. Red swellings were noticed subglottically, also a pronounced bronchitis. Diphtheria bacilli were not present. The Wassermann reaction was negative. The diagnosis of subglottic laryngitis (acute edema of the larynx) was made, and inhalation, an ice collar and expectorants were ordered. On November 7, the patient died suddenly while drinking milk. Cyanosis was not present. Necropsy showed chronic laryngitis with pachydermia of the vocal cords and a slitlike ulcer on the left processus vocalis. Emanating therefrom was a suppurative perichondritis, especially at the cricoid cartilage (posterior wall), edema of the glottis, severe tracheobronchitis and some status thymicolymphaticus.

Case 4.—A woman, aged 23, admitted on Dec. 27, 1926, had been treated with roentgen rays four years previously in another hospital. The larynx was narrow. The patient died suddenly during a tracheotomy. Necropsy revealed a flat cicatrization in the larynx with ringlike narrowing under the vocal cords. An ulcer was present in the pharynx in the region of the cricoid cartilage, with necrosis of the cartilage.

Case 5.—A man, aged 57, admitted Oct. 8, 1925, on account of difficulty in swallowing and hoarseness, had swallowed a fishbone fourteen days previously. The whole right side of the neck was swollen and tender on pressure. The right aryepiglottic fold showed glassy edema, and the right sinus piriformis was edematous. The right side of the larynx could not be seen on account of the swelling of the entrance. A diagnosis of perilaryngeal phlegmon (foreign body?) was made. Inhalation and an ice collar were ordered. On October 10, under ether narcosis, an incision, about 4 cm. in length, was made at the lower border of the sternocleidomastoid muscle, and an artery forceps was introduced into the depth. A large quantity of foul pus was evacuated at the depth of 8 cm. The patient was discharged on October 29 and readmitted on Jan. 21, 1926. A fistula was found at the lower part of the wound. Rather thick pus was evacuated by

pressure on the right side of the larynx. Under local anesthesia, the fistula was slit freely, and after retraction of the margins of the wound a thick fishbone, 2.5 cm. in length, was removed. The wound was curetted with a sharp spoon. On January 28, when the patient was discharged the wound was healing satisfactorily. On February 4, it had healed entirely.

The author discusses thoroughly the etiology, pathologic anatomy, histology, therapy and course of the disease. The etiology is summarized as follows: (1) local inflammatory or traumatic changes in the larynx (for instance, submucous laryngitis, ulcers of the mucous membrane of the larynx in grip [case 3] and injury by a fishbone [case 5]); (2) continuous propagation of the inflammation from the diseased organs of the throat contact infection (for instance, angina); (3) hematogenous causes, and (4) injury by roentgenization.

The changes of the cartilage in perichondritis of the larynx are varied: The author could establish four different kinds of injuries of the cartilage: (1) processes of breaking up by granulation tissue, (2) signs of degeneration, (3) hyperplastic changes and (4) processes of reparation in the form of fibrous metaplasia and replacement of the destroyed cartilage by connective tissue and formation of bone.

Hansberg and Hinsberg strongly urged laryngofissure in certain cases of perichondritis of the larynx. Three of the author's cases ended fatally, but none of the patients died of suffocation. Hinsberg called attention to the fact that weakness of the heart threatens patients who submit to tracheotomy for perichondritis. In two of the author's patients, the heart was found well contracted at necropsy. Perhaps a continuous moderate dyspnea may cause an overloading of the blood with carbonic acid to such a degree that the respiratory center may be paralyzed. Heart remedies shoulbd be prescribed in cases lasting for weeks or longer. A tracheotomy is indicated even if pronounced dyspnea does not exist, because the larynx is put at rest, and the edema and swelling recede. The diagnosis is not always simple when the disease has reached the chronic stage, and when the edema covers the disease process of the cartilage and a subglottic laryngitis must be considered. Perichondritis, in the chronic stage, has few characteristics. A successful surgical therapy is based on the diagnosis, the location and the severity of the disease. If it is at all probable that a perichondritis is present, the focus must be eradicated completely. As a rule, laryngofissure should be performed, with after-treatment by dilation. Less severe intervention is indicated in extralaryngeal perichondritic diseases. Otto Mayer proved that conservatism frequently leads to success. There are not any set rules. Hinsberg's view that resolute and timely surgical intervention can save many a patient who would be doomed by symptomatic treatment must be supported. No doubt, perichondritis and chondritis of the larynx are extremely dangerous. Hansberg and Hinsberg deserve credit for having introduced the laryngofissure in these conditions and to have insisted on it as a therapeutic measure.

An Apparatus Which Shows the Larynx and Measures It. Wilhelm Trendelenburg, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**:159 (Sept. 5) 1928.

According to the ideas of the author, an apparatus was constructed by Zeiss. A second observer views a virtual mirror picture of the larynx with the aid of a glass plate placed on a plane parallel to the path of the rays. When this picture is observed with binoculars it appears stereoscopic and can be measured. The measuring is simple and exact. The apparatus can also be used for monocular observation.

Amberg, Detroit.

Nose

Nasal Respiratory Deficiency. G. Worms, Arch. internat. de laryng., June, 1928, p. 641; July-August, p. 760.

Dr. Worms divides this lengthy address into five chapters. In the first chapter, he reviews the physiology of respiration. The next chapter is concerned with the

etiology of nasal respiratory deficiency. Under this heading, all the types of nasal obstruction are considered and, in addition, a condition which the author terms functional deficiency or impotency. In the third chapter the direct and remote results of faulty nasal respiration are enumerated. Under the heading diagnosis, all the clinical, laboratory and mechanical means are described in detail. In the fifth chapter, he deals with treatment.

The treatment is considered either as a nasal obstruction or as a functional deficiency. In childhood, the vast majority of nasal obstructions are due to lymphoid vegetation. Occasionally, one encounters what the author terms the pseudo-adenoid condition. There is a type of person in whom the nasal obstruction persists after the removal of the adenoids. The lack of nasal respiration may be due to a hypertrophic rhinitis, constitutional causes — tuberculosis, syphilis, rickets or endocrine disturbances — or familial nondevelopment of the facio-maxillary bones. In the last condition, he believes that good results can be obtained by orthodontia.

In the adult, all nasal obstructions should be surgically dealt with. However, he heartily condemns the removal of normal turbinates. Tuberculosis and syphilis should always be considered in the presence of these conditions, and surgery should be instituted only after consultation with the internist. Allergy and systemic intoxications should be ruled out. All other methods failing, diastolization has proved of value not only in the child but also in the adult.

When the author is convinced that the condition is functional, a course of reeducation of respiration is practiced. Several types of spirometers are described in detail, but the principal one consists mainly in nasal inspiration with forced buccal expiration. After a time, this is supplanted by special gymnastic respiratory exercises and finally by a complete course of physical culture. The author claims that brilliant results are obtained by reeducation of the respiratory function.

NASAL OBSTRUCTION IN CHILDHOOD (PSEUDO-VEGETATIONS). TREATMENT BY DIASTOLIZATION. MARCEL WISNER, Arch. Internat. de laryng., June, 1928, p. 735.

Aside from syphilis, tuberculosis and congenital deformities, nasal obstruction in the very young and in new-born infants is due to adenoid vegetation and the sequelae of the common head cold. After reasonable efforts to free the pharynx of the adenoids, the obstruction many times persists. The author contends that such cases are due to a thickening of the nasal and pharyngeal mucosa and offers diastolization as a relief.

After a reasonable sterilization of the nose by shrinking with epinephrine and the instillation of silver salts over a period of a few days, a soft rubber tube closed at one end and conforming to the curve of the nasal cavity is inserted. A rubber bulb is attached, alternate inflation and deflation of the tube is accomplished and, at the same time, a to and fro movement is executed with the tube.

The purpose of this procedure is not to procure dilatation but to secure stimulation of the nasal mucosa, decongestion of the glandular engorgement and a reflex action of the sphenopalatine ganglion. At the same time, a study should be made of the maternal status, especially in syphilis and tuberculosis.

Three typical cases were reported with favorable results.

ROTH, Chicago.

A MODIFIED SEPTUM FORCEPS. KENZO TAKAHASHI, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**:130 (June 16) 1928.

The author states that the instruments of Jansen-Middleton, of Freer-Gruenwald and of Ballenger-Foster are too ungainly and too massive for the narrow field of operation; that the Killian and the Ballenger-Foster forceps are uncertain and slide off, and that the forceps of Bruening and of Luc have a faulty lock. Sixteen years ago, the author modified the Luc forceps by changing the handle and the lock. The shanks are much more slender, so that the eye can control the work. The oval mouthpiece grasps firmly just so much as is intended.

REMOVAL OF STEEL AND IRON PIECES FROM THE NOSE. OSKAR BESELIN, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**:128 (June 16) 1928.

The inner pole magnet consists of a solenoid ring, through which the patient puts his head. When the current is turned on, a homogenous power field develops which is strongest in the center. Pieces of iron within the ring become magnetic by accumulation of lines of current. In a case in point, a steel probe introduced into the nose removed a splinter 11 by 2 mm. from the right olfactory region, in the right nostril. Such an apparatus is used by ophthalmologists and should also be utilized by rhinologists.

AMBERG, Detroit.

Miscellaneous

BASAL METABOLISM RATE IN OTOSPONGIOSA. M. SENARAIL, H. LASSALLE and S. BOAPUNT, Ann. d. mal. de l'oreille du larynx **42**:1 (Jan.) 1928.

Otospongiosa with its predominance among women, coming on at puberty with the associated endocrine disturbances — its familiar tendencies — has lent interest to this study. The investigation of the basal metabolism rate gives the student a better insight into the pathogenesis of osseous dystrophies.

The basal metabolism rate was observed in fifteen cases of definite otospongiosa. One was plus 10, four were normal and ten were below minus 18. In estimating the phosphorus against the alkaline reserve in the blood, the authors find the phosphorus value increased, while the alkaline reserve was decreased. In estimating the blood calcium, they found the total amount lowered at the expense of the organic and not the colloidal content.

INTRADERMAL INJECTION OF PEPTONE IN HAY-FEVER. MAURICE JOCAD (LYONS), Ann. d. mal. de l'oreille du larynx **42**:460 (March) 1928.

By the intradermal injection of a 50 per cent solution of peptone, the author was able to obtain better results in the treatment of patients with hay-fever than by pollin desensitization. He institutes treatment early with a dose of 1.3 cc. and continues treatment daily. Most of his favorable results were obtained in patients who received from twenty to thirty injections.

He considers the intradermal therapy less likely to produce anaphylactic shock and better tolerated by the patient. He has obtained better results with the peptone therapy than with any other method that he has used in the past fifteen years.

ROTH, Chicago.

MOTHERSILL'S REMEDY FOR SEASICKNESS: A SECRET REMEDY CONTAINING SCOPOLAMINE. H. DANNENBERG, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**:132 (June 16) 1928.

Experiments carried on after the method of Joachimoglu led to the conclusion that Mothersill's remedy for seasickness does not contain atropine but scopolamine.

AMBERG, Detroit.

Society Transactions

COLLEGE OF PHYSICIANS OF PHILADELPHIA, SECTION ON OTOLOGY AND LARYNGOLOGY

K. M. Houser, M.D., *Reporter*

Oct. 17, 1928

James A. Babbitt, M.D., *Chairman*

A Case of Dyspnea in a Child 1 Year Old, and Otitis Media Complicating a Case of Pneumonia. Dr. Thomas G. Aiken.

Dr. Aiken presented the case of a child, aged 1 year, with troublesome dyspnea. The thymus was decidedly enlarged, which was supposed to be the cause of the symptoms. The difficulty in breathing, however, did not disappear after the reduction of the thymus by irradiation. After the introduction of a bronchoscope, it was found that the dyspnea was caused by a transverse band of mucous membrane partly obstructing the trachea, about 1½ inches (3.77 cm.) above its bifurcation.

A second case was that of a child who developed acute otitis during an attack of pneumonia. After recovery, it was discovered that the child had a chronic ethmoidal condition which antedated the onset of pneumonia. Dr. Aiken raised the question whether this focus of infection had not really been the cause of the pneumonia.

DISCUSSION

Dr. B. Alexander Randall: I believe that the possible connection between pneumonia as an agent causing otitis should have more attention. Could an ear which is the seat of a chronic infection sometimes give rise to pneumonia? One must always be on guard for cases of thymic dyspnea.

Dr. George B. Wood: I am partial to the use of carbolized glycerin in the treatment for otitis media. The glycerin does not dry, and on account of this the canal is not blocked by dried secretions.

Complete Facial Paralysis and Meningitis as a Complication of Acute Otitis Media. Dr. David N. Husik.

Dr. Husik reported the case of a woman who developed left facial paralysis two days after the onset of acute otitis media of the left ear. When she was admitted to the hospital, evidence of mastoid suppuration was discovered, and mastoidectomy was performed. She recovered promptly from the facial paralysis, and was soon discharged from the hospital. She was readmitted, eleven days after leaving the hospital, with pain, a rise in temperature and stiffness of the neck. The wall of the left mastoid was in good condition, but the right mastoid showed involvement. The latter was opened and pus was released. The sigmoid sinus was exposed but evidence of infection was not present. The spinal fluid was cloudy and contained hemolytic streptococci. Death occurred in a few days as the result of meningitis. Autopsy showed pus in both the sphenoid and the ethmoid cells. The question raised was, Did the meningitis arise from the mastoid areas or from the pus retained in the sphenoid and ethmoid sinuses?

DISCUSSION

Dr. William Hewson: Have cultures been made from the contents of the sphenoid and ethmoid sinuses?

DR. GEORGE B. WOOD: It is my understanding that meningitis may occur in otitis without evidence of continuity between the ear and the meninges. I have seen a patient with a similar case of basal meningitis, which condition did not show a pathway of infection between the meninges and the ear.

DR. GEORGE FETTEROLF: Dr. Mosher, of Boston, believes that a close pathologic tract between the ear and meninges is rarely found. To prove that there is a pathway, careful microscopic examination is necessary and will perhaps reveal a septic thrombophlebitis.

DR. HARRY ROTHROCK: Several years ago, I saw a patient with meningitis, which was supposed to be of otitic origin. At autopsy, nothing but a small flake of dried pus was found in the middle ear.

ANGINA, BLOOD STREAM INFECTION AND AGRANULOCYTOSIS. DR. KARL M. HOUSER and DR. EDWARD ROSE (by invitation).

The literature on agranulocytic angina was covered in detail. At the present time, including the case reported by the speakers, the total number of cases of this type reported is seventy-eight. The case reported was that of a woman, aged 48, who developed sore throat, chills and fever. She gave the history of repeated attacks of quinsy, and at the time of examination there was so much swelling of the left peritonsillar tissues that a collection of pus was suspected. Incision of this area, however, did not reveal pus. The day after examination she was admitted to the hospital, of the University of Pennsylvania, at which time it was found that the total leukocyte count was 600 cells per cubic millimeter, with a total absence of granulocytes. The number of platelets, red cells and the amount of hemoglobin were approximately normal. A blood culture showed a positive type 3 pneumococcus infection. The patient died in three days in spite of repeated blood transfusions.

The literature on agranulocytosis reveals that many different organisms have been recovered from the blood stream, among which are hemolytic streptococci, staphylococci, *B. pyocyaneus, B. coli,* pneumococci, and *Streptococcus viridans.* The speakers concluded that the condition termed agranulocytic angina could not justifiably be considered a specific disease entity, for the following reasons:

1. Marked leukopenia is known to occur in severe infections of different types.

2. The variety of necrotic foci found in these cases argues against specificity in the same condition.

3. Epidemicity of the disease has not been reported.

4. The disease is not confined to middle-aged women. It has occurred frequently in men, and age groups show a wide variation.

5. A constant etiologic agent has not been established.

6. Satisfactory experimental reproduction of the condition has not been accomplished.

One pathologic condition of interest, which has never before been reported, was the necrosis of the walls of the arterioles and venules with hyalinization of their contents.

DISCUSSION

DR. GEORGE B. WOOD: I have seen two patients with conditions that I considered agranulocytosis. The symptoms in either case did not quite fit the picture. The first was that of a boy, aged 10 years, who in the terminal stages of his illness had necrotic lesions of the throat and a white cell count of 1,000, 1 per cent of which were neutrophils. The other was that of an elderly woman who had a bilateral myringotomy performed on account of slight inflammatory changes in the ear. She did not improve and a leukocyte count of 1,000 was discovered, which in twenty-four hours dropped to 150 per cubic millimeter, with no neutrophils present. Death occurred in both cases.

DR. ROBERT HUNTER: I have seen a case of sepsis with granulocytopenia in a woman, following a simple fracture of one of the bones of the leg.

A Comparison of the Outlines of the Frontal Sinus, in Vivo, as Shown by Transillumination and Roentgen Picture. Dr. George Fetterolf and Dr. Edward E. Sprenkel (by invitation).

The frontal sinuses of a group of medical students were studied in the following manner: Transillumination was performed and the upper margins of the frontal sinuses, as shown by transmitted light, were outlined on the forehead of the subject with opaque paint. X-ray pictures were then taken. The results were interesting in that the frontal sinuses in each case were much smaller than they appeared to be on transillumination. On the average, the frontal sinuses appeared to extend from one-half to three-quarter inches (1.27 to 1.87 cm.) higher in the frontal bone than was demonstrated by the x-ray pictures.

DISCUSSION

Dr. George B. Wood: I find difficulty in procuring much valuable data from transillumination.

Dr. Curtis C. Eves: I am interested in the observations reported and believe that transillumination frequently gives information that is of great value and which cannot be obtained by the x-ray picture.

Dr. Phillip Stout: I have found the results of transillumination and those of the x-ray picture to agree remarkably well.

Report from British Medical Association of 1928. Dr. George M. Coates.

In the absence of Dr. Coates, Dr. William Hewson read his paper telling of the experiences of the writer while attending the meeting of the British Medical Association.

Book Reviews

DISEASES OF THE THROAT, NOSE AND EAR. By DAN MCKENZIE, M.D. Volume 2. Second edition. Pp. 677. St. Louis: C. V. Mosby Company, 1928.

This is a work of 677 pages bound in two volumes which is a great convenience to the reader. It is a valuable contribution on the study of diseases in this special field. Each part—the throat, nose and ear—is treated with equal emphasis, and the author shows equal familiarity with each subject. The clearness with which he presents the various clinical problems demonstrates a background in clinical experience that is acquired only through years of studious painstaking work, and then only comes to one who has acquired the habit of clear, logical thinking.

The text constitutes an excellent reference book for the use of the general practitioner when he desires information concerning problems in the field of otolaryngology. It will be of great value as well to those who specialize in this field.

The reviewer finds little in the book with which he is not in complete accord. The author is accurate to an unusual degree in his descriptions of anatomic relations which are so complicated in otolaryngology. He does succeed in confusing the infundibulum with the nasofrontal duct (page 355). The two are not the same. The infundibulum is a term applied by the Basle Nomina Anatomica to the trough which extends the entire length of the hiatus semilunaris. The nasofrontal duct usually, though not invariably, opens into the anterior end of the infundibulum.

The text discussing the acute and the chronic suppurative otitis media seems more suitable for those who have had a sufficient clinical experience to appreciate a presentation which takes for granted a knowledge which the beginner does not have. As a guide for the young practitioner without such experience it might seem to be advocating operative measures in the great majority of cases of acute otitis media with or without manifest symptoms of mastoiditis; and, what is even more serious perhaps, advocating radical operative treatment in almost all cases of persisting chronic suppurative otitis media.

The reviewer finds it somewhat difficult to follow the author fully in his discussion of acute mastoiditis. On page 482 appears the statement that "mastoiditis if diagnosed . . . operation should not be delayed." On page 500 he would restrict the term "mastoiditis only to those cases in which some overt and definite indication of mastoid osteitis exist." In his subsequent discussions of the symptoms and indications for operative treatment the author does not bring out with sufficient clearness the fact that mastoiditis, that is, an extension of the inflammation to the membrane lining the pneumatic spaces of the mastoid process, occurs commonly in the early stages of an otitis media sometimes with, and often without, manifest symptoms. This is true particularly in the pneumatic type of mastoid with palpable clinical evidence when the roentgenogram shows the cells to be filled with an exudate but when, nevertheless, there is not any evidence that "osteitis exists" which constitutes the proper indication for operative intervention. Such cases of mastoiditis are common in the early stages of acute otitis media and, unless complicated by such symptoms as an unusually high temperature or persisting severe pain, they are, in the minds of most clinicians, best left alone at least during the early stages; that is, until the persistence of the profuse purulent discharge, even in the absence of other pronounced local symptoms, gives evidence that an "osteitis" has developed. As a matter of fact, is not this the procedure which physicians invariably advocate for the cases of acute otitis media occurring in connection with the nonpneumatic type of mastoid when, because of this anatomic variation, the manifest symptoms of an involvement of pneumatic spaces so easily recognized in the pneumatic type are absent?

In the discussion of indications for operative measures in cases of chronic suppurative otitis media the author hardly brings out with sufficient clearness the clinical observation that in most of these cases an actual menace from a possible serious complication does not exist. He does not bring out with sufficient clearness, at least for the younger student to comprehend, the diagnosis of those rather exceptional cases of chronic running ears in which because of a bone-invading process the radical exenteration is indicated.

The chapter covering the operative work on the ear seems to the reviewer rather radical when compared with the chapters dealing with operative work in sinus disease in which the indications for operative work are more carefully guarded. Conservatism is always commendatory which advocates the careful evaluation of the indications for operative work.

SINUS THROMBOPHLEBITIS. INFLAMMATORY DISEASE OF THE VENOUS SINUSES OF THE DURA MATER. By ALFRED BRAUN, M.D. Pp. 269. New York: Paul B. Hoeber, Inc., 1928.

The author has endeavored to present a complete account of this the most frequent serious complication of suppurative otitis media. The anatomy of the temporal bone and the relations of the sinuses concerned in these infections are set forth clearly and graphically. The illustrations present many of these relations in an entirely new perspective. There are 111 original drawings made by the author.

The book includes a short chapter on the development of the sinuses and chapters on each of the following subdivisions: The Anatomy, The Etiology and Pathology, Symptoms and Diagnosis, and Treatment. A bibliography of ten pages includes all the important contributions in the American as well as in the foreign literature. The volume represents an important contribution to otologic literature.

Directory of Ophthalmological and Otolaryngological Societies*

NATIONAL

AMERICAN MEDICAL ASSOCIATION, SECTION ON LARYNGOLOGY, OTOLOGY AND RHINOLOGY

Chairman: Dr. William V. Mullin, Cleveland Clinic, Cleveland.
Secretary: Dr. Gabriel Tucker, Bronchoscopic Clinic, University Hospital, Philadelphia.
Place: Portland, Ore. Time: July 8-12, 1929.

AMERICAN BRONCHOSCOPIC SOCIETY

President: Dr. C. J. Imperatori, 17 E. 38th St., New York.
Secretary-Treasurer: Dr. Louis H. Clerf, 128 S. 10th St., Philadelphia.

AMERICAN LARYNGOLOGICAL ASSOCIATION

President: Dr. Bryson Delavan, 40 E. 41st St., New York.
Secretary: Dr. George M. Coates, 1721 Pine St., Philadelphia.
Place: San Francisco. Time: July 4-6, 1929.

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY

President: Dr. Hill Hastings, 1136 W. 6th St., Los Angeles.
Secretary: Dr. R. L. Loughran, 33 E. 63d St., New York.
Place: San Francisco. Time: July 4-6, 1929.

AMERICAN OTOLOGICAL SOCIETY

President: Dr. J. Gordon Wilson, 104 So. Michigan Ave., Chicago.
Secretary: Dr. Thomas J. Harris, 104 E. 40th St., New York.

AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. Harris P. Mosher, 828 Beacon St., Boston.
President-Elect: Dr. William H. Wilder, 122 S. Michigan Boul., Chicago.
Executive Secretary: Dr. William P. Wherry, Medical Arts Bldg., Omaha.

LOCAL

THE COLORADO OTO-LARYNGOLOGICAL SOCIETY

President: Major Royal Reynolds, Fitzsimmons General Hospital, Aurora, Colo.
Secretary: Dr. Rex L. Murphy, Metropolitan Bldg., Denver, Colo.
Place: Assembly Room of Metropolitan Bldg. Time: First Saturday of each month from October to May.

SECTION ON OPHTHALMOLOGY AND OTO-LARYNGOLOGY OF THE MEDICAL SOCIETY OF THE DISTRICT OF COLUMBIA

Chairman: Dr. Walter A. Wells, 1606, 20th St., N. W., Washington.
Secretary: Dr. J. N. Greear, Jr., 1740 M St., Washington.
Place: 1718 M St., N. W. Time: 8 p. m., third Friday of each month.

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* Secretaries of societies are requested to furnish the information necessary to make this list complete and to keep it up to date.

ATLANTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. Arthur J. Fort, Medical Arts Bldg., Atlanta, Ga.
Secretary: Dr. Leon E. Brawner, 157 Forrest Ave. N. E., Atlanta, Ga.
Place: Academy of Medicine, 38 Prescott St. N. E. Time: 8 p. m., last Thursday of each month.

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY

President: Dr. Arthur M. Corwin, 25 E. Washington St., Chicago.
Secretary: Dr. Austin A. Hayden, 25 E. Washington St., Chicago.
Place: Grill Room, Stevens Restaurant, 16 N. Wabash Ave. Time: 6 p. m., first Monday of each month from October to May.

INDIANAPOLIS OPHTHALMOLOGICAL AND OTO-LARYNGOLOGICAL SOCIETY

President: Dr. Lafayette Page, Hume-Mansur Bldg., Indianapolis.
Secretary: Dr. Kenneth L. Craft, Hume-Mansur Bldg., Indianapolis.
Place: University Club. Time: 6:30 p. m., second Thursday of each month from October to May.

NEW ORLEANS OPHTHALMOLOGICAL AND OTOLOGICAL SOCIETY

President: Dr. J. Raymond Hume, Maison Blanche Bldg., New Orleans.
Secretary-Treasurer: Dr. W. A. Wagner, Pere Marquette Bldg., New Orleans.
Place: Eye, Ear, Nose and Throat Hospital, New Orleans.
Time: 8 p. m., third Thursday of each month from September to June.

SECTION ON OTOLOGY AND LARYNGOLOGY OF THE BALTIMORE CITY MEDICAL SOCIETY

Chairman: Dr. Waitman F. Zinn, Medical Arts Bldg., Baltimore.
Secretary: Dr. Moses L. Breitstein, 1212 Eutaw Pl., Baltimore.
Place: 1211 Cathedral St. Time: 8:30 p. m., last Friday of each month.

DETROIT OTO-LARYNGOLOGICAL SOCIETY

President: Dr. William Fowler, 1048 Maccabees Bldg., Detroit.
Secretary-Treasurer: Dr. Don A. Cohoe, 13535 Woodward Ave., Detroit.
Place: Maccabees Bldg. Time: Third Wednesday evening of each month from October to May.

THE KANSAS CITY EYE, EAR, NOSE AND THROAT SOCIETY

President: T. S. Blakesley, Lathrop Bldg., Kansas City, Mo.
Secretary: Dr. A. E. Eubank, Argyle Bldg., Kansas City, Mo.
Time: Third Thursday of each month from September to May; the November, January and March meetings are devoted to clinical work.

NEW ENGLAND OTOLOGICAL AND LARYNGOLOGICAL SOCIETY

President: Dr. Francis P. Emerson, 520 Commonwealth Ave., Boston.
Secretary-Treasurer: Dr. Charles T. Porter, 520 Commonwealth Ave., Boston.

ACADEMY OF MEDICINE OF NORTHERN NEW JERSEY SECTION ON EYE, EAR, NOSE AND THROAT

Chairman: Dr. Lee W. Hughes, 1019 Broad St., Newark.
Secretary: Dr. Earle LeRoy Wood, 31 Lincoln Park, Newark.
Place: 91 Lincoln Park, South. Time: 8:45 p. m., second Monday of each month.

THE SECTION OF LARYNGOLOGY AND RHINOLOGY OF THE NEW YORK ACADEMY OF MEDICINE

Chairman: Dr. David H. Jones, 114 E. 54th St., New York.
Secretary: Dr. Edward Frankel, Jr., 152 W. 58th St., New York.
Place: 103d St. and Fifth Ave.
Time: 8:30 p. m., fourth Wednesday of each month from October to May.

THE OTOLOGICAL SECTION OF THE NEW YORK ACADEMY OF MEDICINE

Chairman: Dr. Clarence H. Smith, 2 E. 54th St., New York.
Secretary: Dr. James Garfield Dwyer, 57 W. 57th St., New York.
Place: 103d St. and Fifth Ave. Time: Second Friday of each month from October to May.

EASTERN NEW YORK EYE, EAR, NOSE AND THROAT ASSOCIATION

President: Dr. J. Ivimey Dowling, 116 Washington Ave., Albany, N. Y.
Secretary-Treasurer: Dr. L. Prescott Brown, 33 Bancker St., Albany, N. Y.

CINCINNATI OTO-LARYNGOLOGICAL SOCIETY

President: Dr. C. C. Jones, Doctors Bldg., Cincinnati.
President-Elect: Dr. Harris H. Vail, 24 E. 8th St., Cincinnati.
Secretary-Treasurer: Dr. M. F. McCarthy, 2600 Union Central Bldg., Cincinnati.
Place: University Club. Time: 6:45 p. m., second Tuesday of each month from October to May.

THE OPHTHALMOLOGICAL AND OTOLARYNGOLOGICAL SECTION OF THE CLEVELAND ACADEMY OF MEDICINE

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